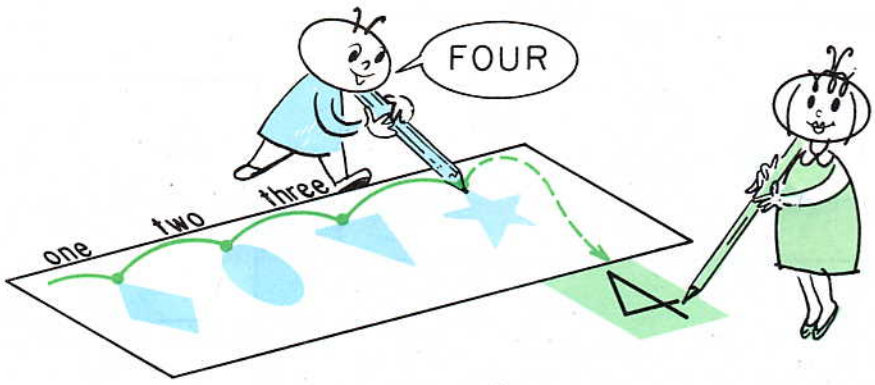
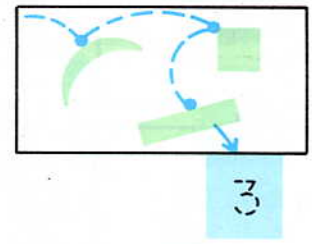
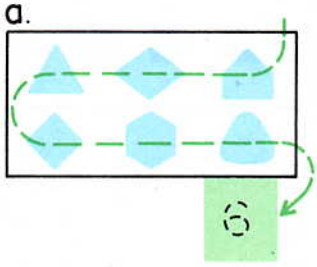


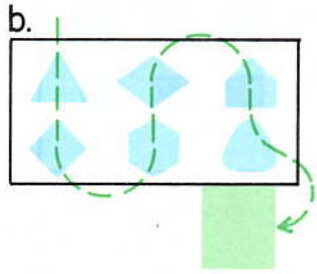


Follow the dotted lines as you count.

a.



b.



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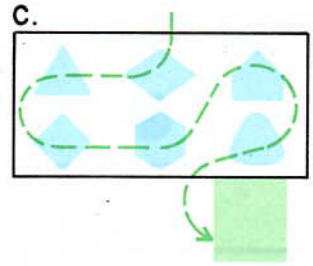

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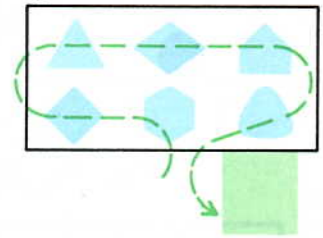
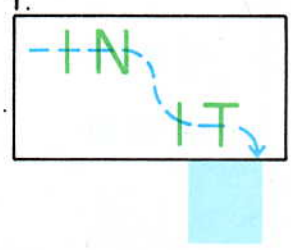
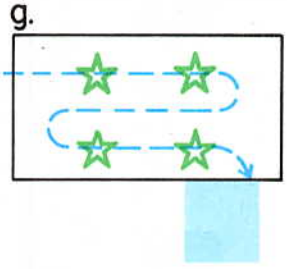


e.

f.



g.



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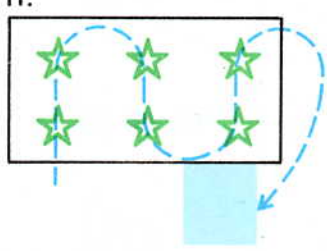
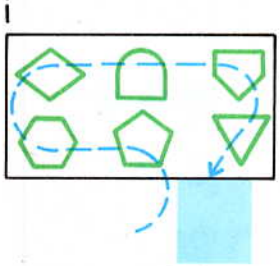
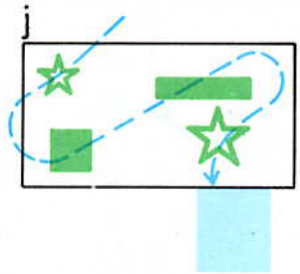


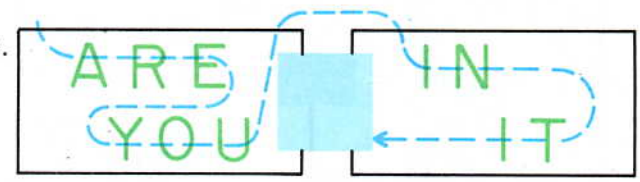
i.



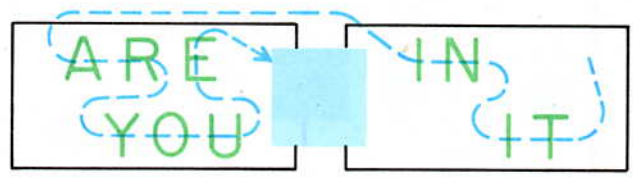
j.



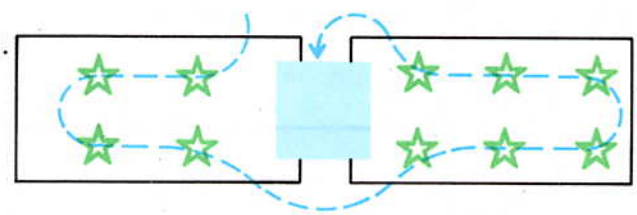
k.



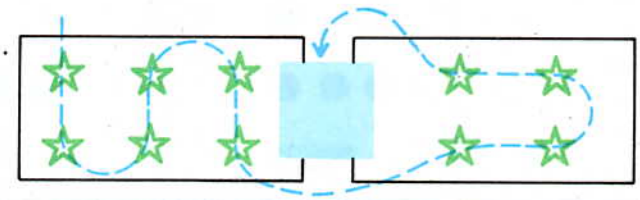
l.



m.



n.



o. 6 + 4 = ☐

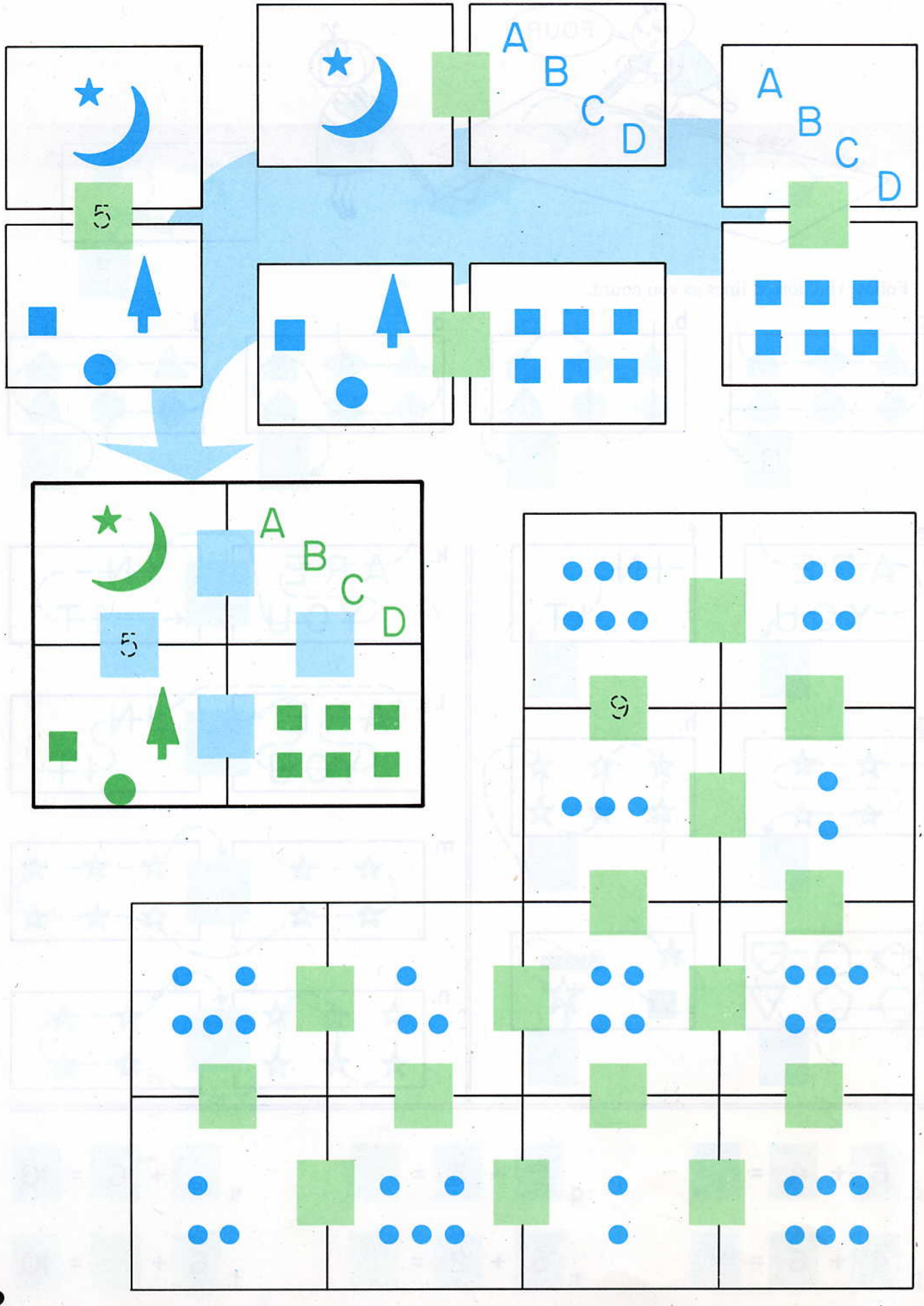
q. 2 + 3 = ☐

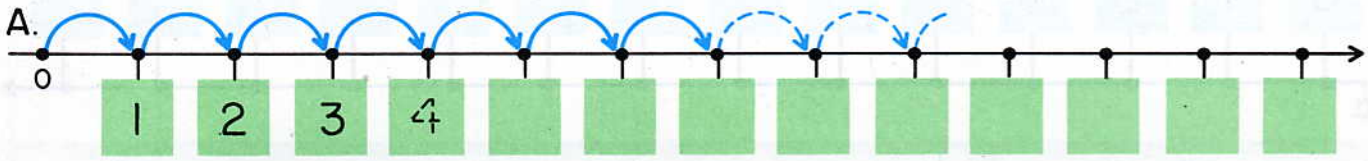
s. ☐ + 6 = 10

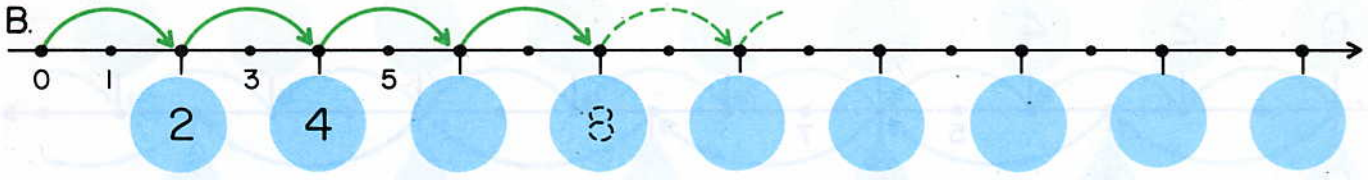
p. 4 + 6 = ☐

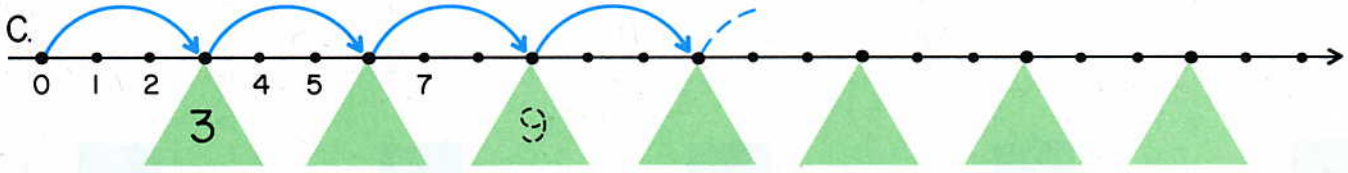
r. 3 + 2 = ☐

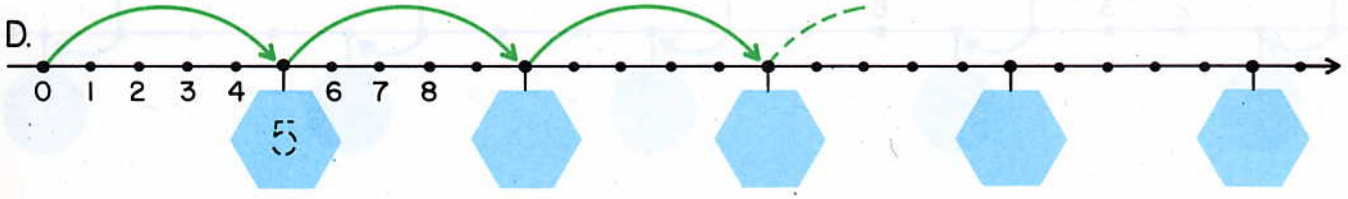
t. 6 + ☐ = 10

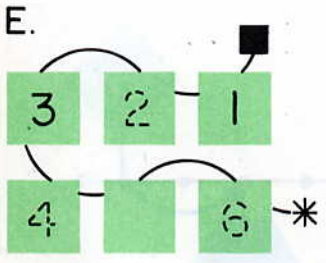

A
B
C
D
5
A
B
C
D
5
A
B
C
D
9

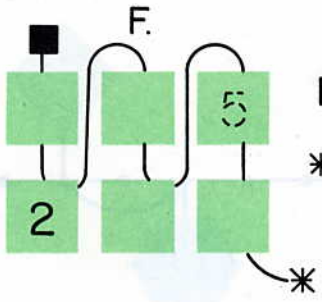

A.
0
1
2
3
4

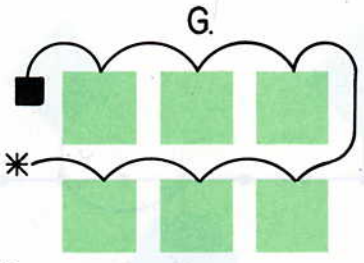

B.
0
1
3
5
2
4
8

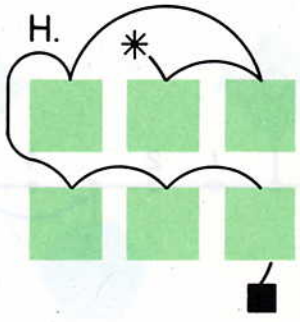

C.
0
1
2
4
5
7
3
9

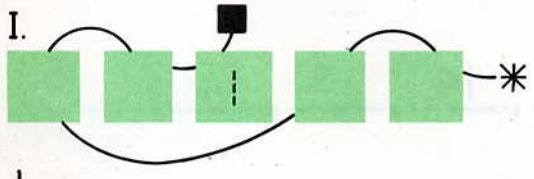

D.
0
1
2
3
4
6
7
8
5

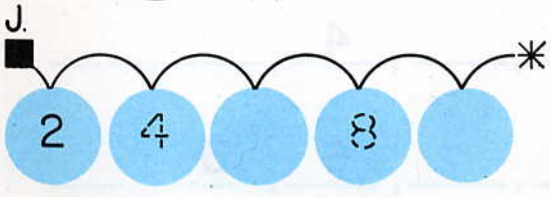

E.
3
2
1
4
6

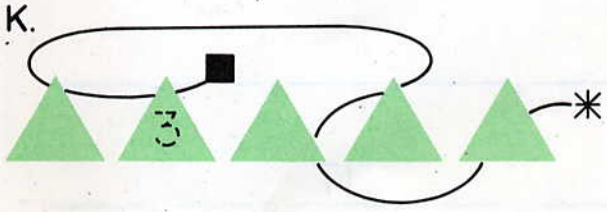

F.
5
2

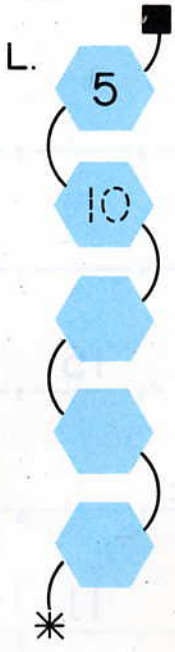

G.

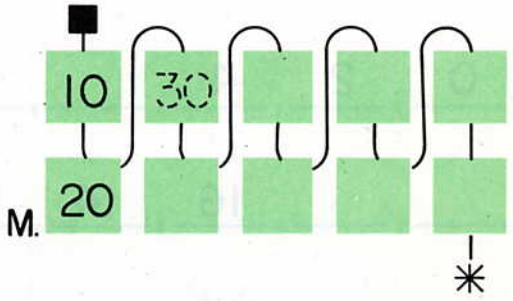

H.

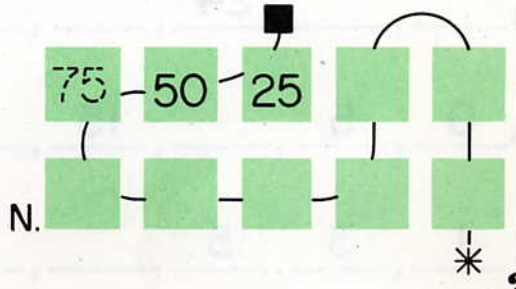

I.
1

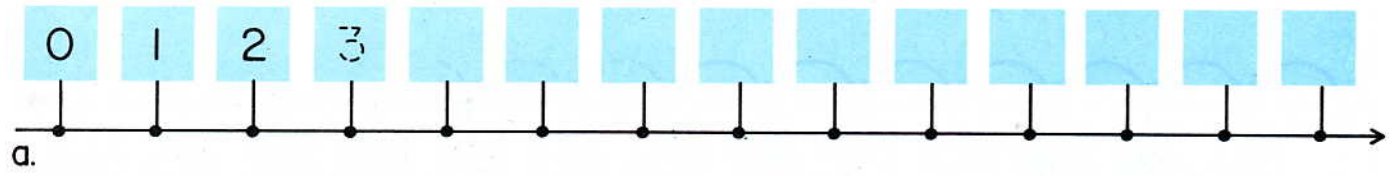

J.
2
4
8


K.
3

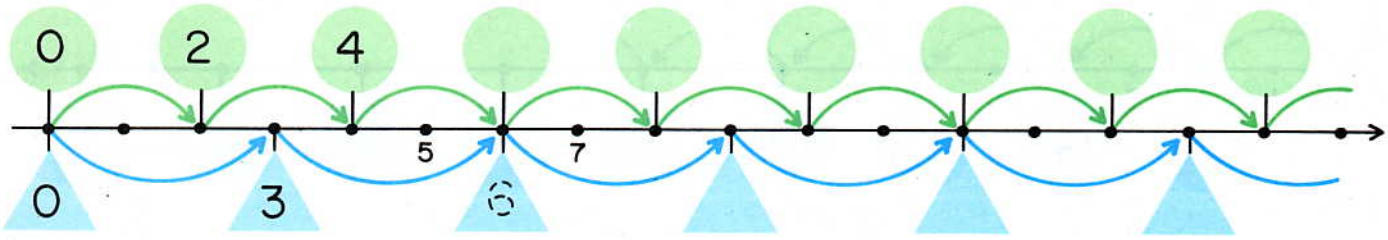

L.
5
10


M.
10
30
20

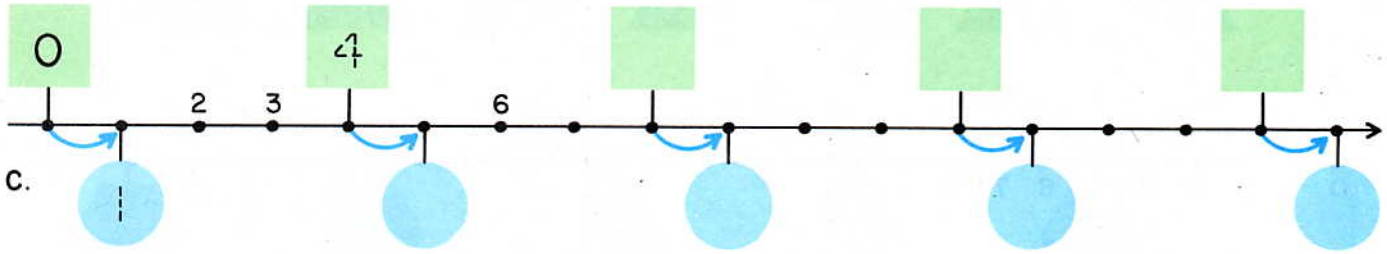

N.
75
50
25



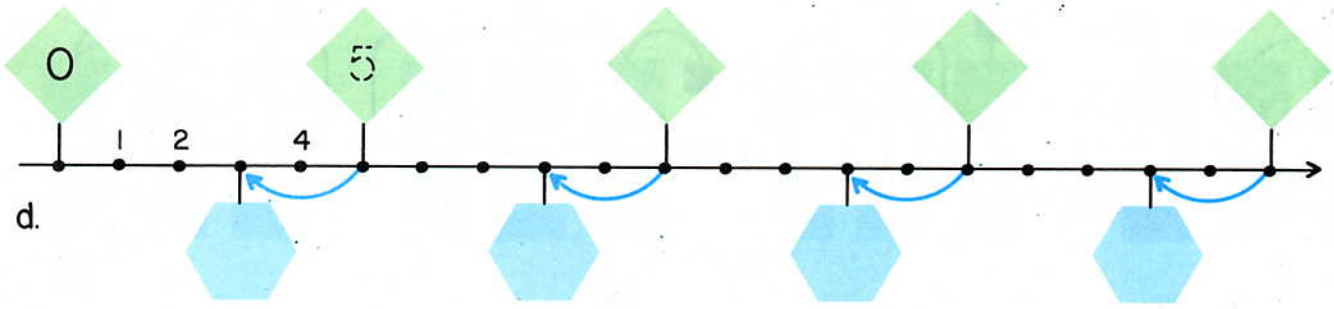
a.



b.



c.



d.

e. 0 , 2 , 4 , ___ , ___ , ___ , ___ , 14 , ___ , ___ , ___

f. ___ , ___ , 16 , 14 , 12 , ___ , ___ , ___ , 4 , ___ , ___

g. ___ , ___ , 24 , ___ , ___ , 15 , ___ , ___ , 6 , 3 , ___

h. 0 , 5 , ___ , 15 , ___ , ___ , ___ , ___ , ___ , ___ , ___

i. 1 , 3 , 5 , ___ , ___ , 11 , ___ , ___ , 17 , ___ , ___

Look for clues that suggest what you are to do.

A

HE IS ~~HERE~~

B

BILL RAN ~~FAST~~

C

EIGHT ~~HUNDRED~~ TWE~~LVE~~

D

LOOK FOR CLUES THAT HELP

E

F

	A	B	C	D	E	F
Total number of letters	8				10	15
Letters crossed out	3	5	7		4	7
Letters not crossed out	5	6		15		

What Are My Rules?

I. 26, 24, 22, 20, ___, ___, ___, ___, ___, ___, ___, ___

II. ___, ___, ___, 27, 25, 23, 21, ___, ___, ___, ___, ___

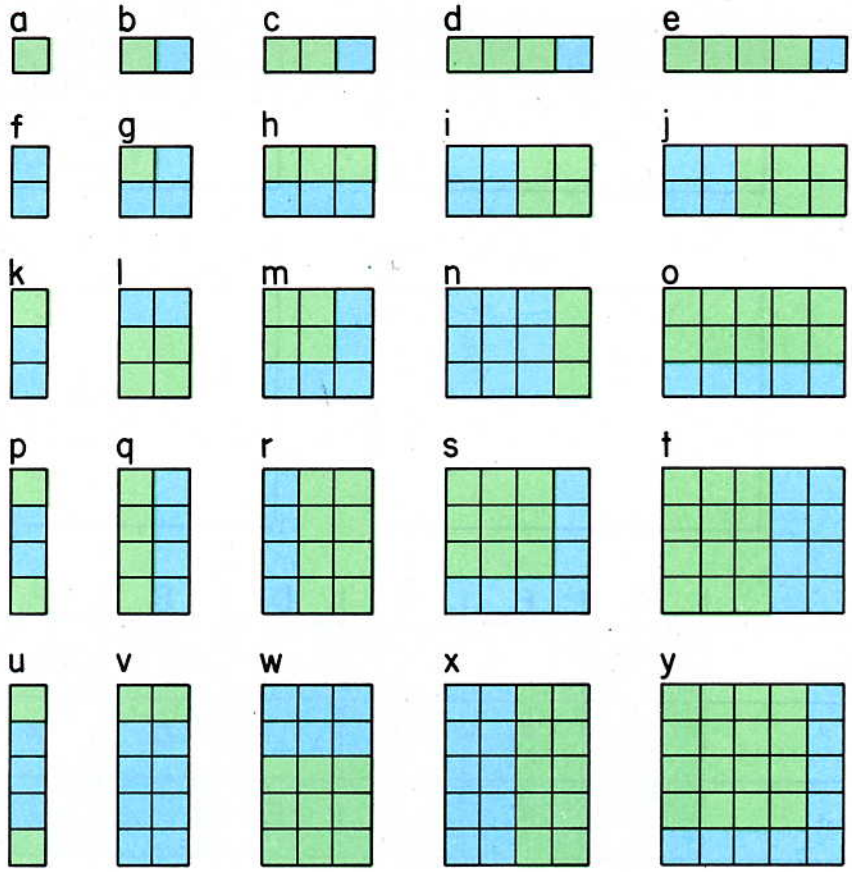
III. ___, ___, ___, ___, 27, 24, 21, ___, ___, ___, ___, ___

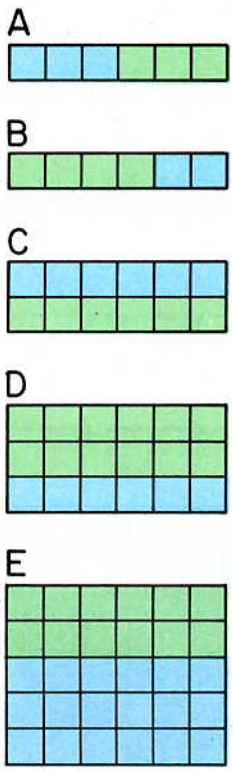
IV. ___, ___, 38, 35, ___, ___, 26, 23, ___, ___, ___, ___

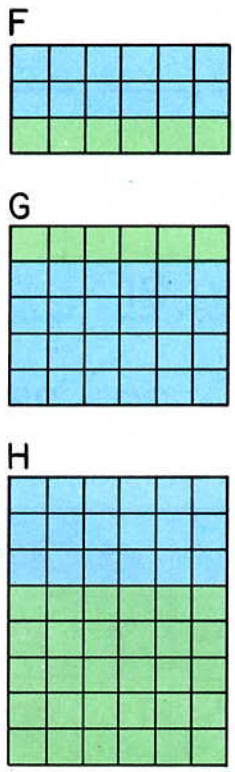
V.

9	12	8	11		23		13	20	40	21		d
7	4	3	9	6	3	19	7	10	1		2	e
2		5		1	20	0		10		17	68	d–e

How many tiles are blue? How many tiles are green? How many tiles in all?







	Blue	Green	Total
x			
y			
A			
B			
C			
D			
E			
F			
G			
H			

	Blue	Green	Total
a			
b			
c			
d			
e			
f			
g			
h			
i			
j			
k			
l			
m			
n			
o			
p			
q			
r			
s			
t			
u			
v			
w			

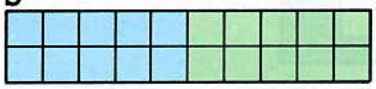
How many tiles are green?

How many tiles are blue?

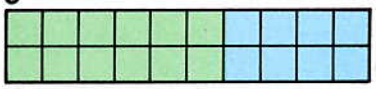
How many tiles in all?

a

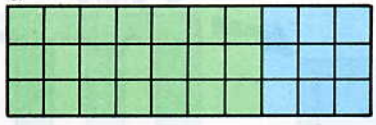
b



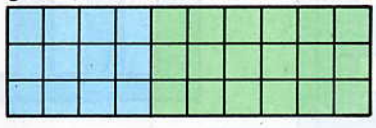
c



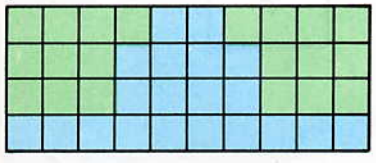
d



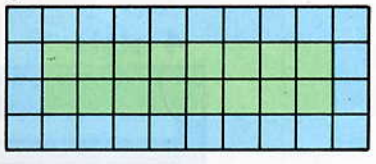
e



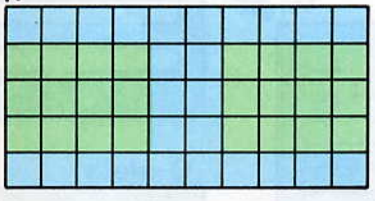
f



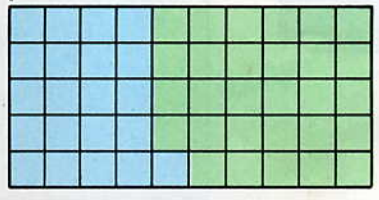
g



h

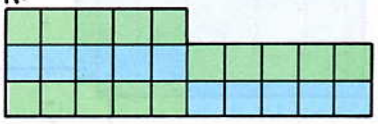


i

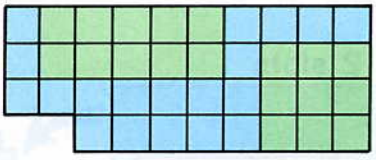


j

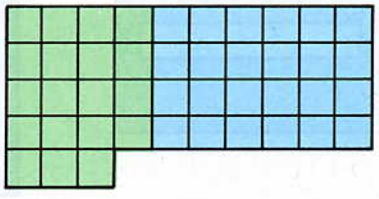
k



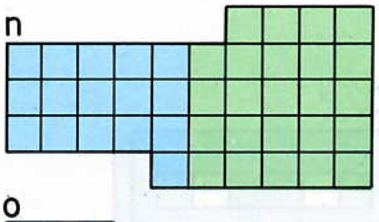
l



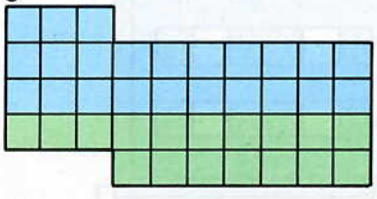
m



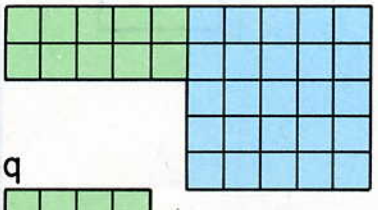
n



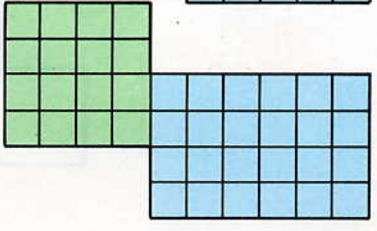
o



p

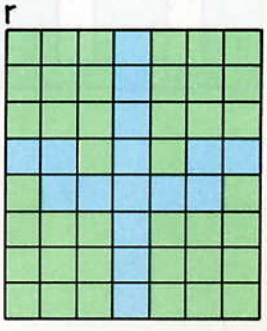


q

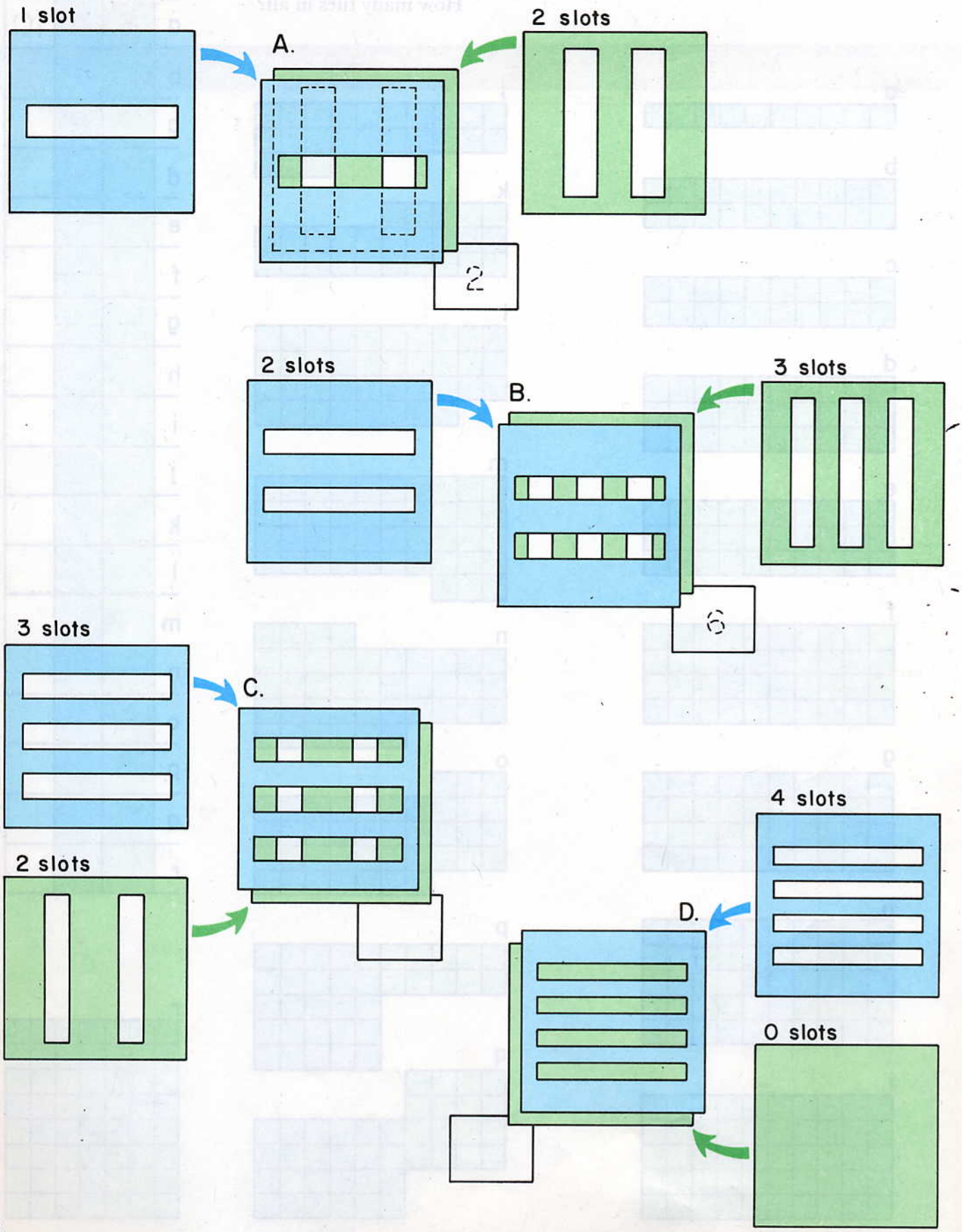


	Green	Blue	Total
a	6	4	10
b	10		
c		8	
d			
e			
f			
g			
h			
i			
j			
k			
l			
m			
n			
o			
p			
q			
r			

r

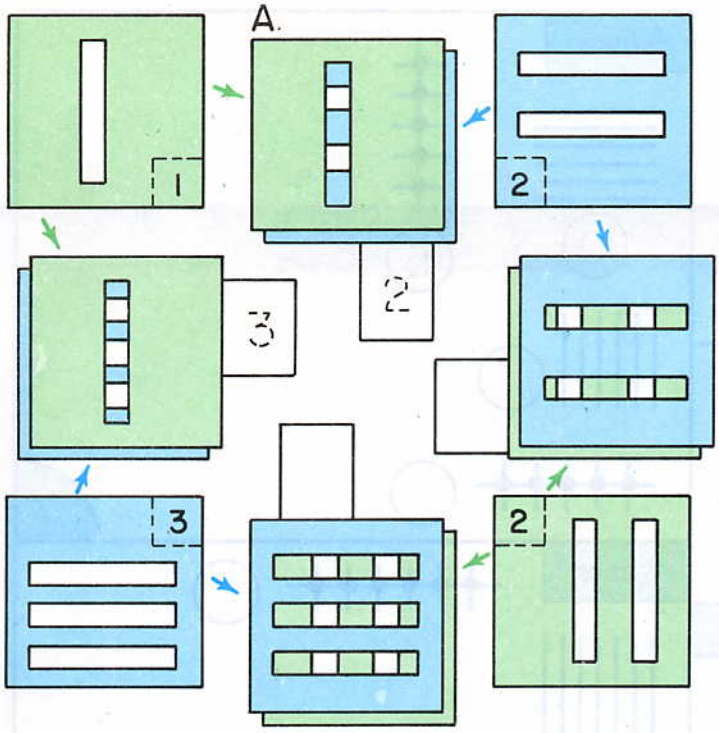


Imagine a series of cards — with slots cut in them. Put one on top of the other. In how many places does light show through?

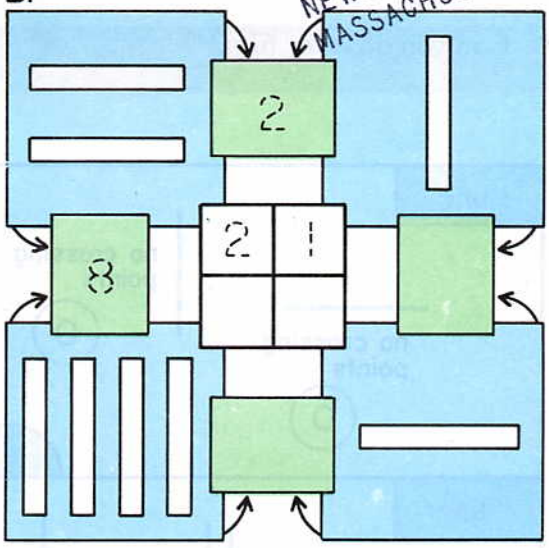


E. PAUL GOLDENBERG
1246 WALNUT STREET
NEWTON HIGHLANDS
MASSACHUSETTS 0216

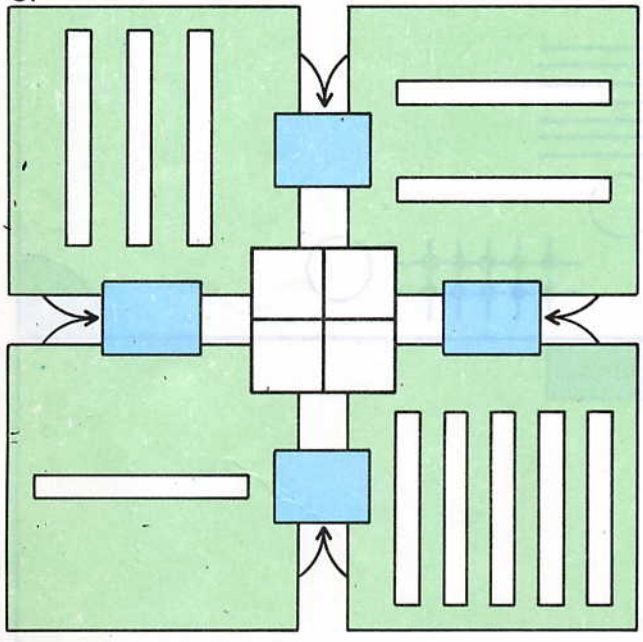
A.



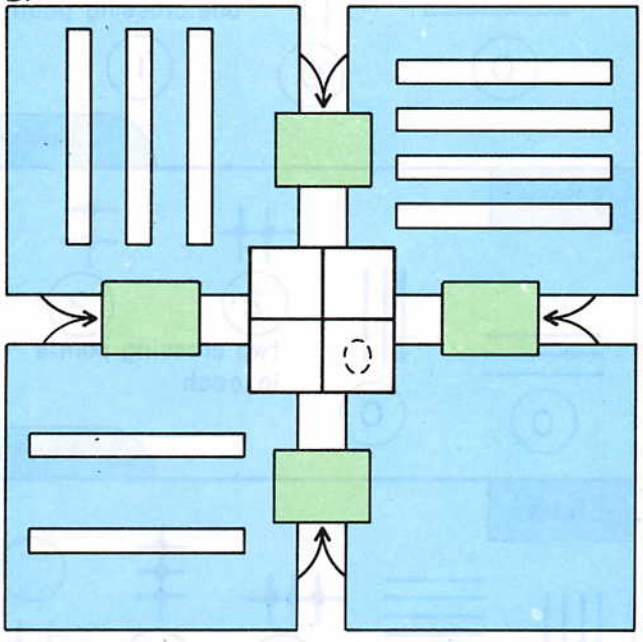
B.



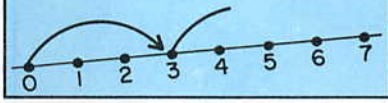
C.



D.



E.

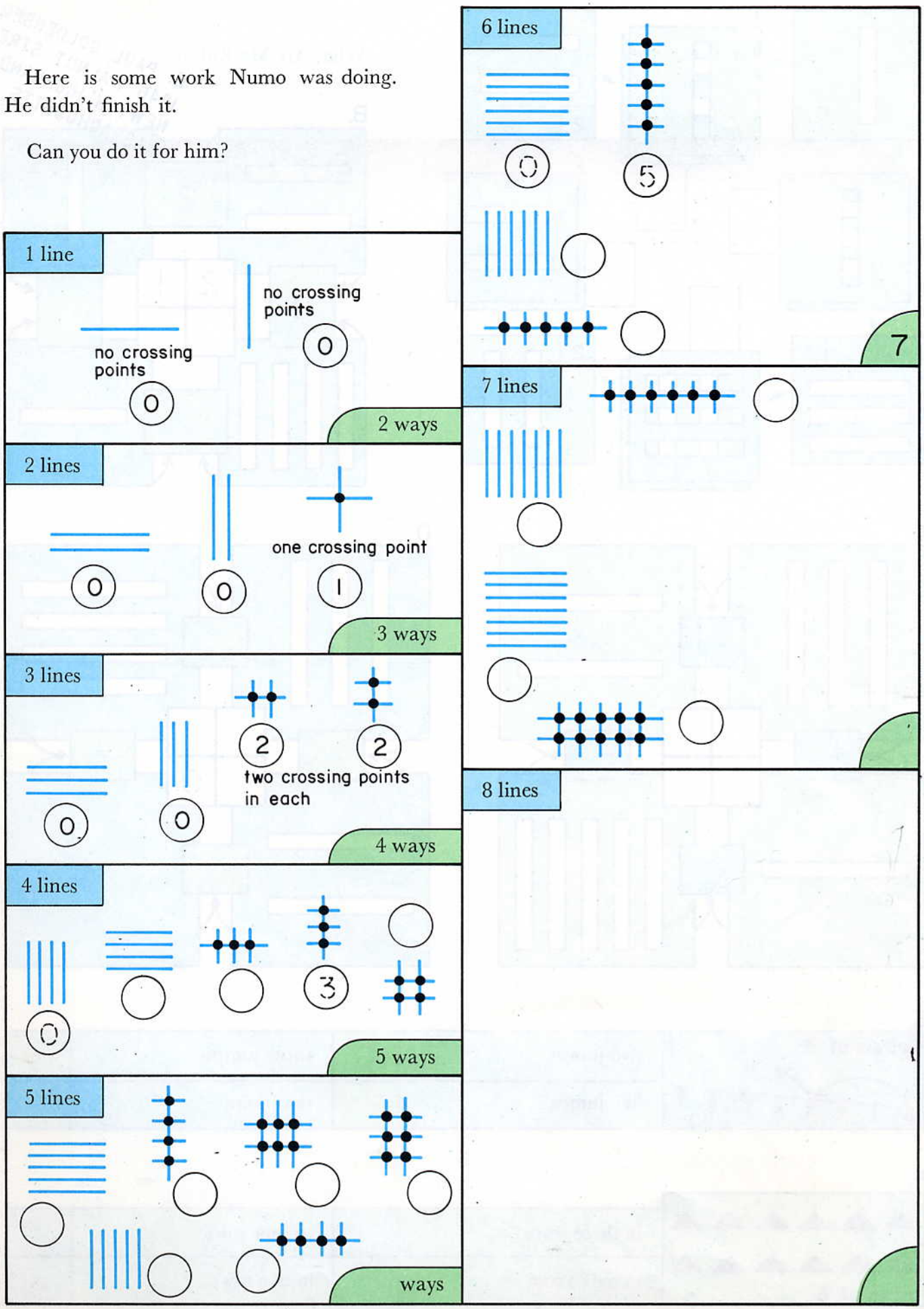
jumps of 3 	two jumps	6	three jumps	
	five jumps		ten jumps	

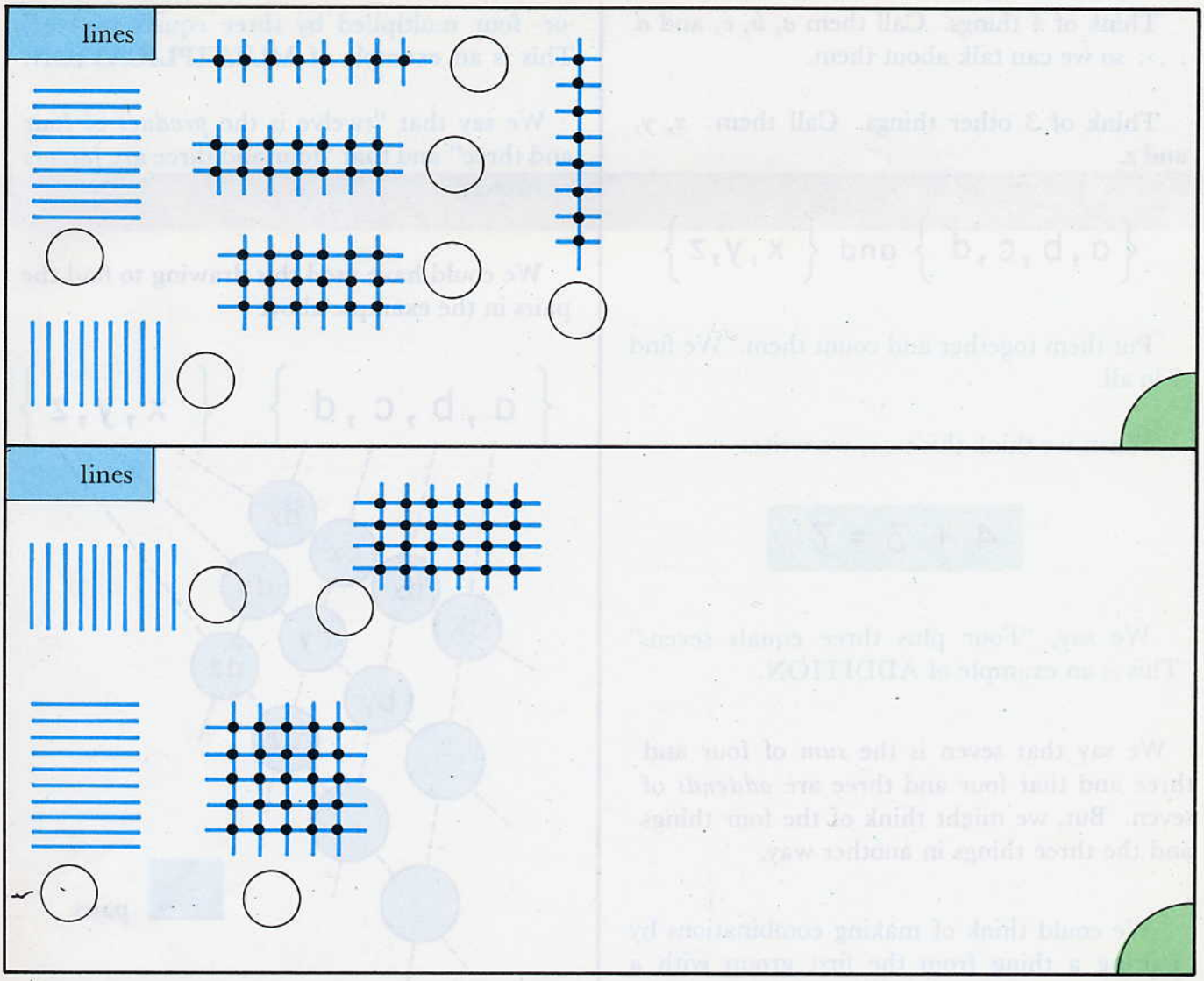
F.

rows of 6	in three rows		in four rows	
	in half a row		in five rows	

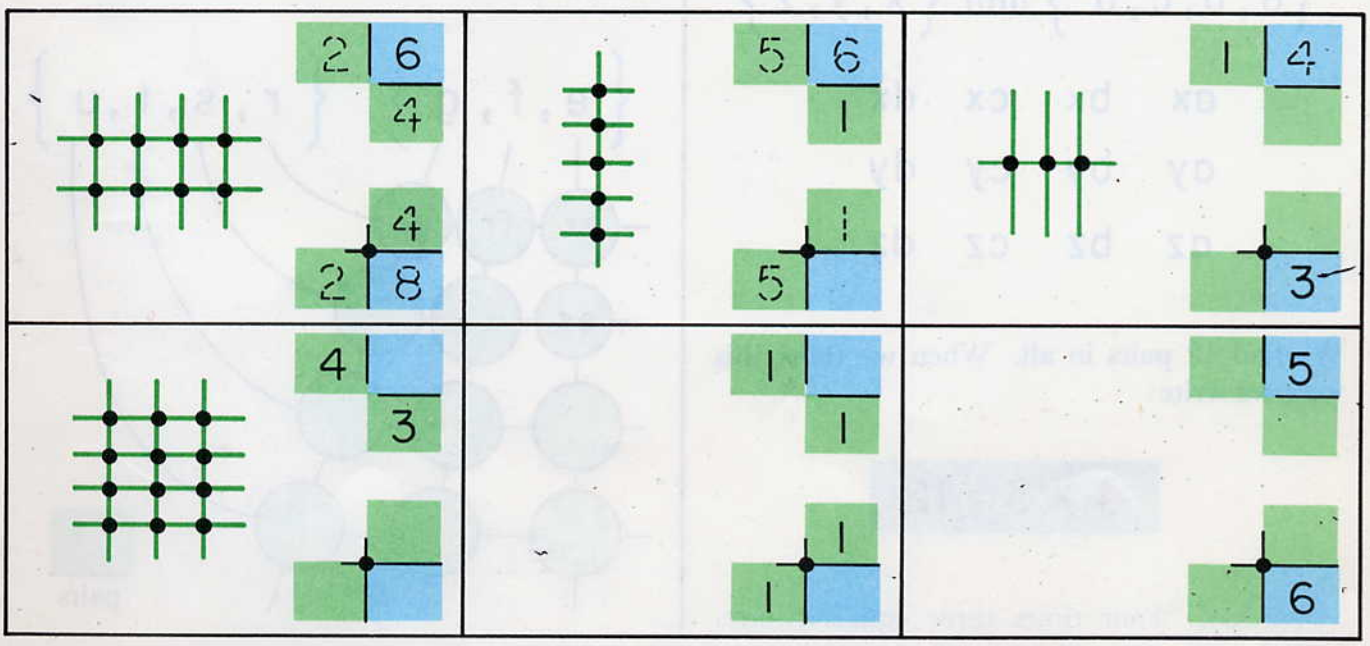
Here is some work Numo was doing. He didn't finish it.

Can you do it for him?





Here is more of Numo's work. Can you find the rules he is following? Help him finish his sketches and records.



Think of 4 things. Call them *a*, *b*, *c*, and *d* . . . so we can talk about them.

Think of 3 other things. Call them *x*, *y*, and *z*.

$$\{a, b, c, d\} \text{ and } \{x, y, z\}$$

Put them together and count them. We find 7 in all.

When we think this way, we write:

$$4 + 3 = 7$$

We say, "Four plus three equals seven." This is an example of ADDITION.

We say that seven is the *sum* of four and three and that four and three are *addends* of seven. But, we might think of the four things and the three things in another way.

We could think of making combinations by pairing a thing from the first group with a thing from the second. We could find all the pairs that can be made this way.

$$\{a, b, c, d\} \text{ and } \{x, y, z\}$$

ax	bx	cx	dx
ay	by	cy	dy
az	bz	cz	dz

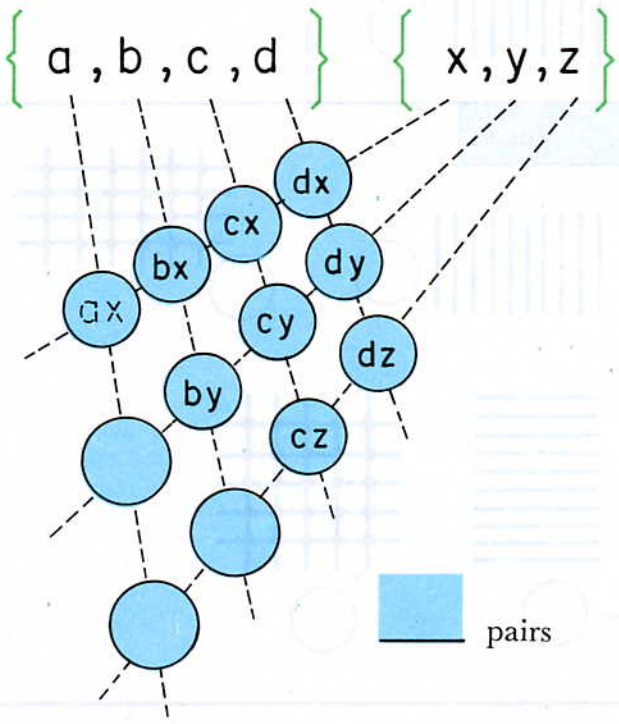
We find 12 pairs in all. When we think this way, we write:

$$4 \times 3 = 12$$

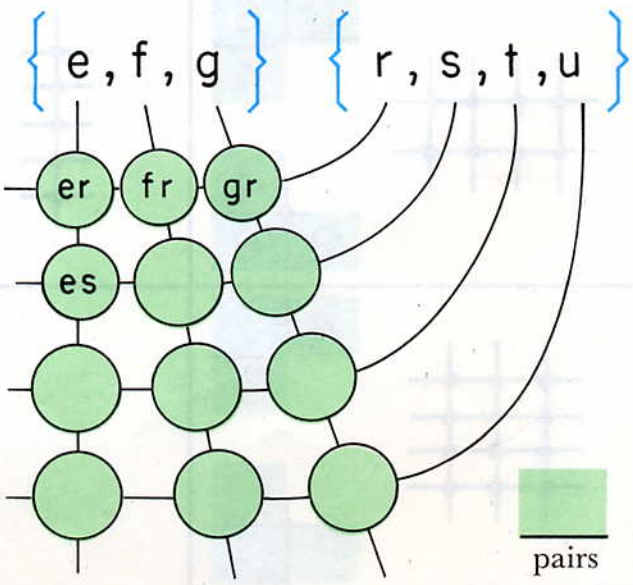
We say, "Four times three equals twelve, or four multiplied by three equals twelve." This is an example of MULTIPLICATION.

We say that "twelve is the *product* of four and three" and that "four and three are *factors* of twelve."

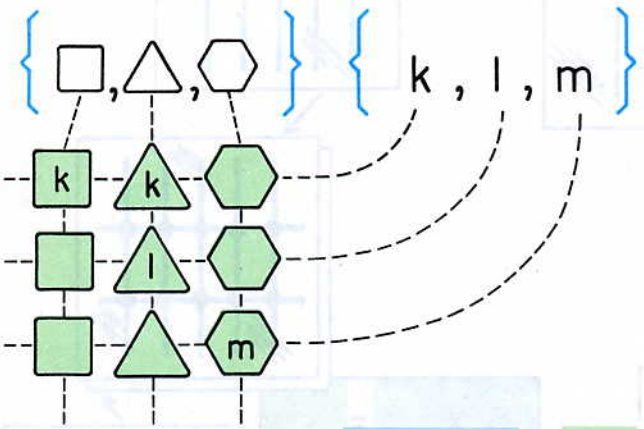
We could have used this drawing to find the pairs in the example above:



Suppose that we had had only 3 things in the first group and 4 in the other. We would have had:

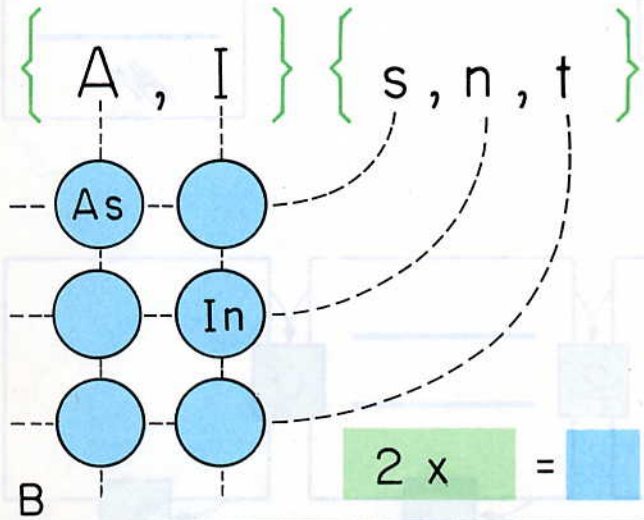


Let's do some more pairing. Remember, each pair of things must get its first thing from the first group and its second thing from the second group.



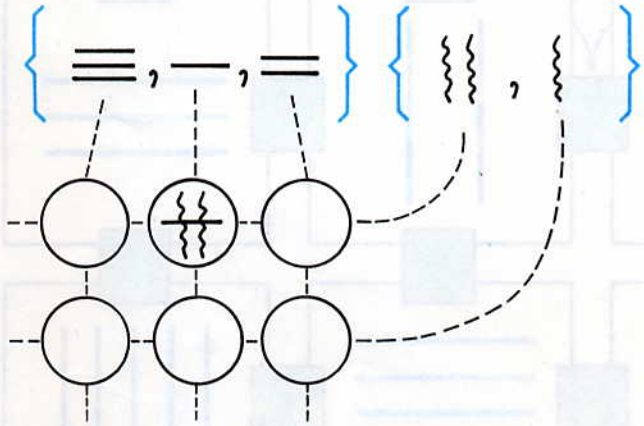
3 x 3 =

A



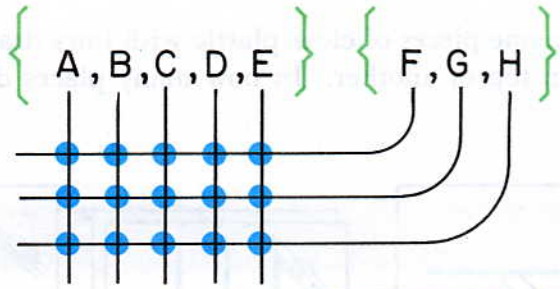
2 x =

B



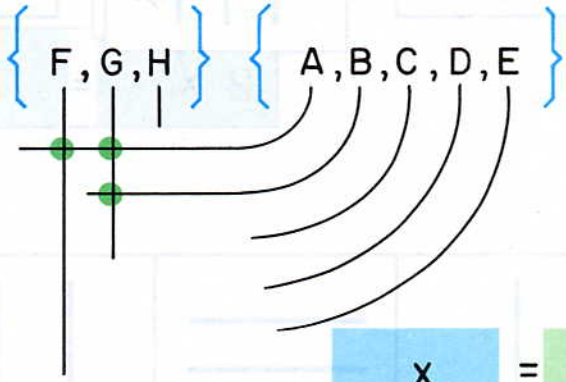
3 x =

C



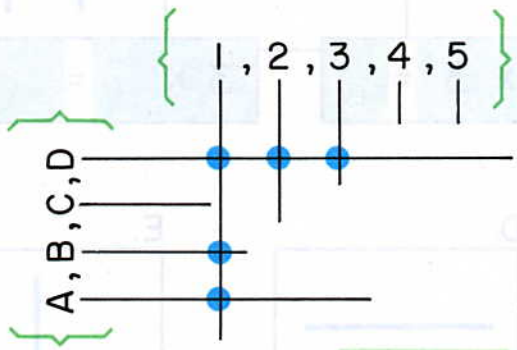
5 x =

D



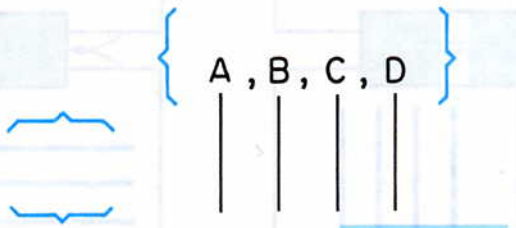
x =

E



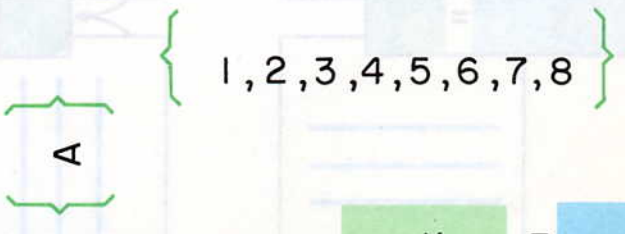
x =

F



0 x 4 =

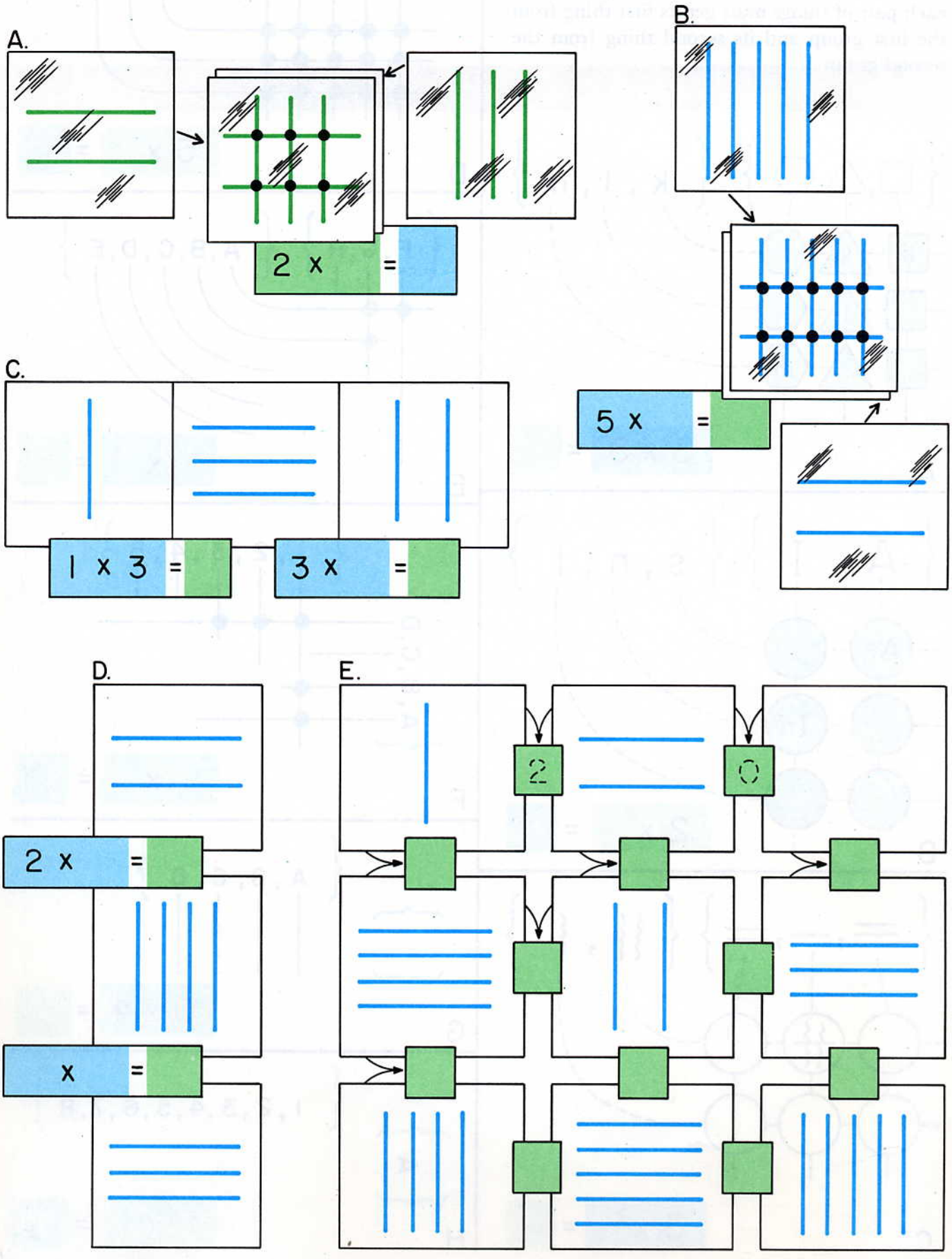
G



x =

H

Imagine pieces of clear plastic with lines drawn on them. Put one on top of another. In how many places do the lines cross?



Bill had some marbles. He had two boxes — one square and one round. He put all the marbles in the two boxes.

What can we say about this situation? Here are two things we might say:

1. If Bill had an even number of marbles, he could have put the same number of marbles in each box.
2. If he had an odd number of marbles, he could not have put the same number in each box.

The records below show some other things we can say about the situation.

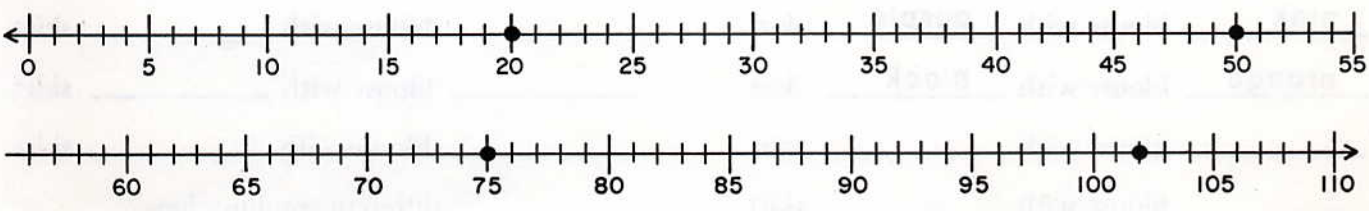
If Bill had 20 marbles	
and if he put ____ in the square box	then he put ____ in the round box
15	5
5	
10	
1	
3	
0	
	18
	6
4	
	7

If Bill had 50 marbles	
and he put ____ in the square box	then he put ____ in the round box
10	
20	
	25
	48
	9
45	
12	
	29
17	
	13

If Bill had 75 marbles	
and he put ____ in the square box	then he put ____ in the round box
70	
10	
45	
	25
31	
6	
	8
	59
35	
	38

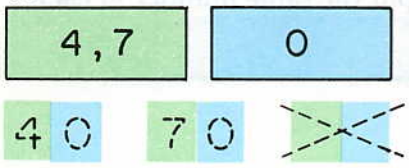
If Bill had 102 marbles	
and if he put ____ in the square box	then he put ____ in the round box
100	
3	
	97
10	
20	
	52
62	
9	
	13
47	

You may wish to use the two number line chunks below to check some of your results.



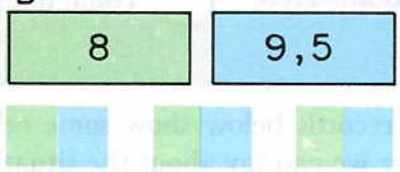
How many 2-digit numbers are there with
the tens digit from the green box
and
the ones digit from the blue box?

A



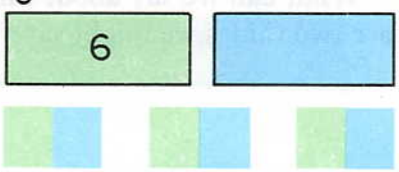
2 numbers

B



____ numbers

C

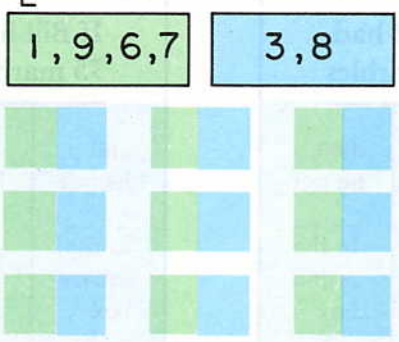


____ numbers

D

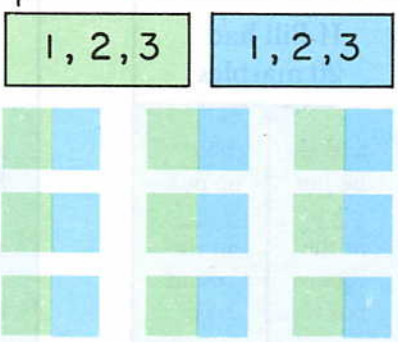
____ numbers

E



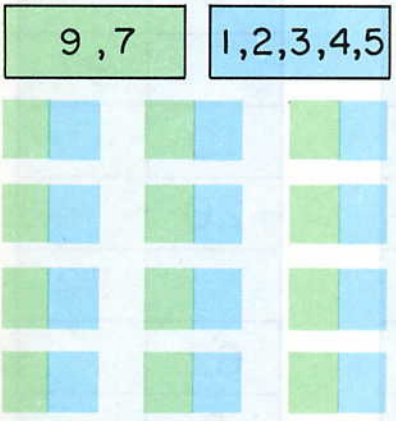
____ numbers

F



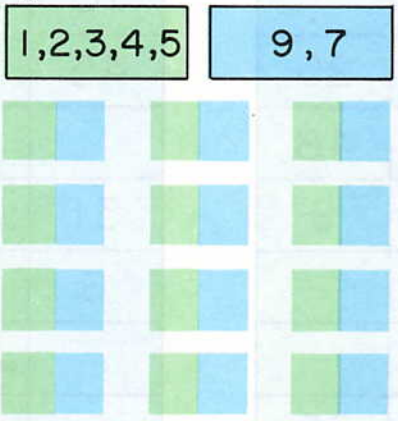
____ numbers

G



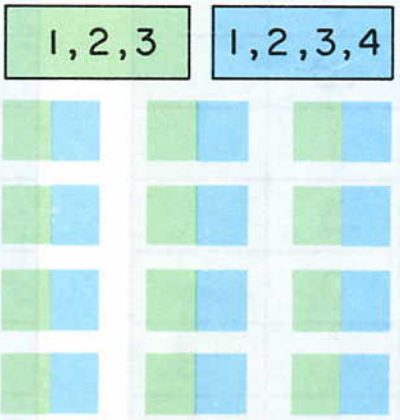
____ numbers

H



____ numbers

I



____ numbers

J

Alice had 4 blouses: pink, orange, white, and brown. She had 3 skirts: black, purple, and blue. How many blouse-skirt combinations does she have?

pink blouse with black skirt

pink blouse with purple skirt

orange blouse with black skirt

____ blouse with ____ skirt

____ blouse with ____ skirt

____ blouse with ____ skirt

____ blouse with ____ skirt

____ blouse with ____ skirt

____ blouse with ____ skirt

____ blouse with ____ skirt

____ blouse with ____ skirt

____ different combinations

How many 2-letter words are there with the first letter from one list and the second letter from the other? Find as many different pairs as you can.

I.

M	e , y

Me My

2 words

II.

S , W	

0 words

III.

H , B	e

____ words

IV.

T,D,S,N	o

T o

____ words

V.

A	m,n,s,t

____ words

VI.

B , M	y , e

____ words

VII.

I	f , t , n

____ words

VIII.

O , I	n , f

____ words

IX.

A , I	s , n , t

____ words

X.

One Sandwich Per Person

HAMBURGER
HOT DOG
or FISH

FREE

with Onions, Catsup, Mustard, or Nothing.

How many combinations?

Hamburger with mustard

Fish with nothing

Fish with onions

____ with ____

____ with ____ with ____

____ with ____ with ____

____ with ____ with ____

____ with ____ with ____

____ with ____ with ____

____ with ____ with ____

____ with ____ with ____

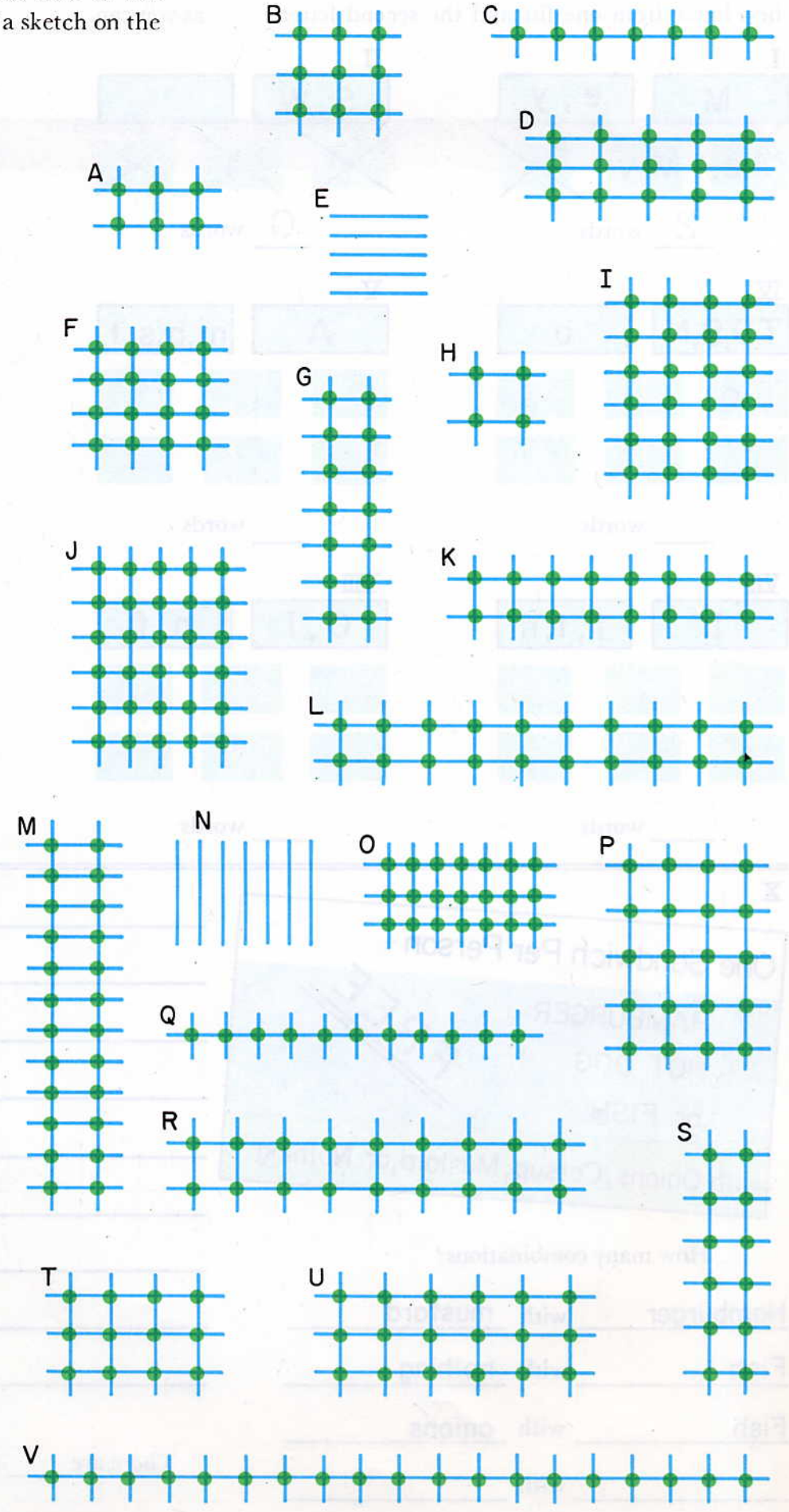
____ with ____ with ____

____ with ____ with ____

There are ____ possible combinations.

Each line of the table fits one of the sketches. Write the letter of a sketch on the line which fits the sketch.

Sketch	Number of lines	Number of crossing points
D	8	15
A	5	6
	4	4
	5	0
	6	9
	10	24
		7
	14	24
	9	14
	10	16
	8	16
	9	20
	11	30
	12	20
	7	12
	8	12
		19
	10	21
		11
	11	18
	7	0
	9	18



Mary had 23¢. She spent more than 15¢.
What can you say about this situation?

We can say that ..... if she spent 23 ¢ then she had 0 ¢ left;

if she spent 22 ¢ then she had 1 ¢ left;

if she spent 21 ¢ then she had _____ ¢ left; etc.

We can make a chart to show many of the possibilities:

If she spent ▢ ¢	23	22	21	20	19		17						
then she had ▢ ¢ left.	0					5		7					

Comment: There are _____ different amounts Mary could spend in the situation given.

Bill had a dime bank with 4 dimes in it.
He received some dimes for his birthday.
He put all the dimes he received into his bank. What can you say?

We can say that ..... if he received 1 dime then he had 50 ¢ in his bank;

if he received 3 dimes then he had _____ ¢ in his bank;

if he received _____ dimes then he had 40 ¢ in his bank; etc.

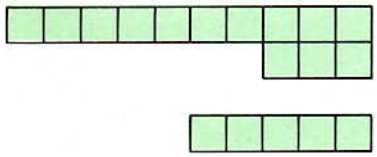
Below we can keep a record. In it we can record the results of many of the possibilities.

If Bill received ▢ dimes	1	3	0	2	5	4	6	8	7	9	
then he had ▢ ¢ in his bank.											

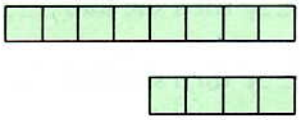
Comment: Did we consider all of the amounts that Bill might have received?

Count the tiles and record your results.

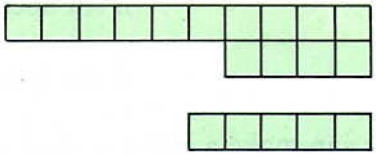
A. 13 + 5 = 18



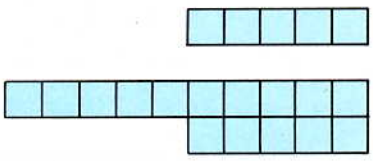
B. 8 + 4 =



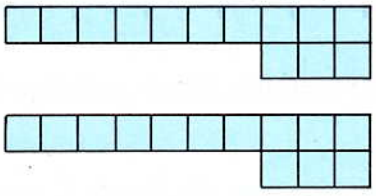
C. 14 + =



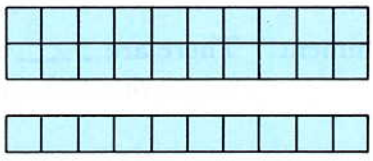
D. + =



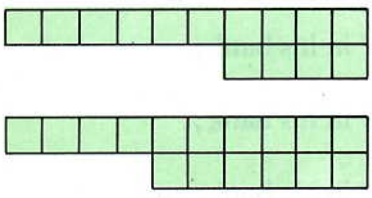
E. + =



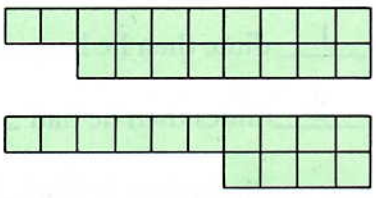
F. + =



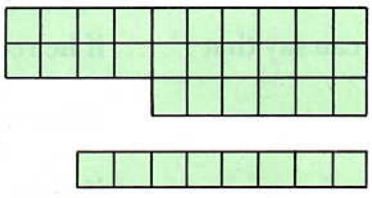
G. + =



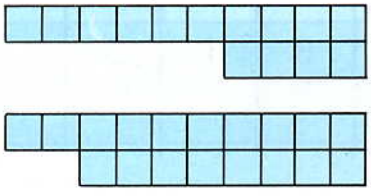
H. + =



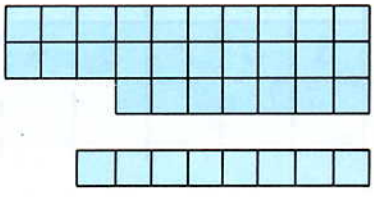
I. + =



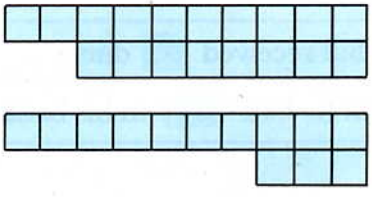
J. + =



K. + =



L. + =

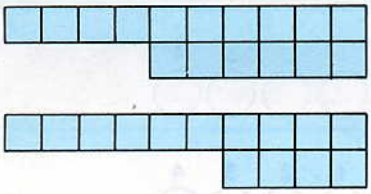


M. What's My Rule?

5	7	13	9	18	27				99	C
8	10	16				41	58	82		C + 3

N.

16 + 14 = ☐



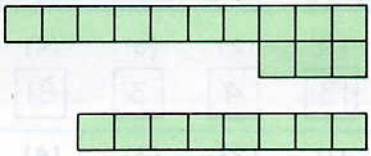
(10 + 6) 16

+ (10 + 4) + 14

(20 + 10)

O.

13 + ☐ = ☐



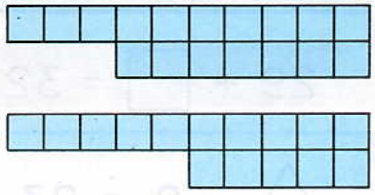
(10 + 3) ☐

+ (0 + ☐) + ☐

(+)

P.

+ ☐ = ☐



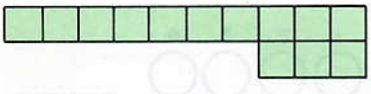
(7 + ☐) ☐

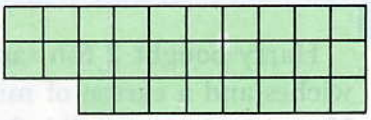
+ (+ 10) + ☐

(12 +)

Q.

+ ☐ = ☐





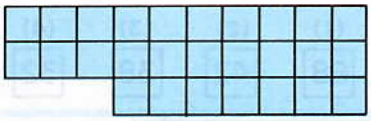
(+ 3) ☐

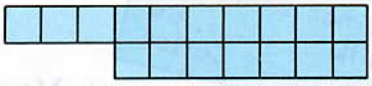
+ (20 + ☐) + ☐

(+)

R.

+ ☐ = ☐





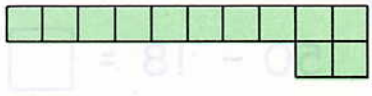
(20 + ☐) ☐

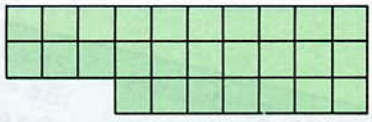
+ (10 + ☐) + ☐

(+)

S.

+ ☐ = ☐





(+ 2) ☐

+ (+ 7) + ☐

(+)

What Are My Rules?

T.

3	7	10
9	1	
	8	

U.

12	4	
7	3	

V.

10	9	
10	7	

W.

4	20	0	10		49		13		100	S
11	27			19		57		92		S + 7

$\begin{array}{r} 20 \\ -\ 7 \\ \hline \end{array}$ (1) 23 (2) 13 (3) 27 (4) 3

Mark correct answer. Mark the furthest from the correct answer.

1 2 3 4 ● ⊗ ○ 4 ← Difference between the answers you marked.

1 $29 + \square = 32$

(1) 13 (2) 4 (3) 3 (4) 61

1 2 3 4 ○○○○ _____

2 $\triangle - 8 = 23$

(1) 31 (2) 40 (3) 35 (4) 15

1 2 3 4 ○○○○ _____

3

$\begin{array}{r} 12 \\ 6 \\ +17 \\ \hline \end{array}$

(1) 25
(2) 47
(3) 8
(4) 35

1 2 3 4 ○○○○ _____

4

$\begin{array}{r} 125 \\ -18 \\ \hline \end{array}$

(1) 107
(2) 143
(3) 117
(4) 133

1 2 3 4 ○○○○ _____

5

$\begin{array}{r} 9 \\ 9 \\ 9 \\ 9 \\ +9 \\ \hline \end{array}$

(1) 36
(2) 59
(3) 45
(4) 70

1 2 3 4 ○○○○ _____

6 $50 - 18 = \square$

(1) 68 (2) 42 (3) 38 (4) 32

1 2 3 4 ○○○○ _____

Cheese Sandwiches	12¢ ea.	Corned Beef	30¢
Hot Dogs	15¢ ea.	Milk	8¢
Fish	20¢ ea.		Carton
Hamburgers	17¢ ea.		

7 Bill bought 2 hamburgers. What did they cost him?

(1) 24¢ (3) 43¢
(2) 34¢ (4) 30¢

1 2 3 4 ○○○○ _____

8 Alice bought a hot dog, a hamburger, and a carton of milk. How much did she spend?

(1) 32¢ (2) 30¢
(2) 18¢ (4) 40¢

1 2 3 4 ○○○○ _____

9 Mary bought two cheese sandwiches and a carton of milk.

(1) 32¢ (3) 28¢
(2) 20¢ (4) 18¢

1 2 3 4 ○○○○ _____

10 Mark had one dollar. He bought as many corned beef sandwiches as he could. How much change did he get?

(1) 20¢ (3) 1¢
(2) 10¢ (4) 29¢

1 2 3 4 ○○○○ _____

11 Harry bought 2 fish sandwiches and a carton of milk. How much more did Sam spend for 2 corned beef sandwiches?

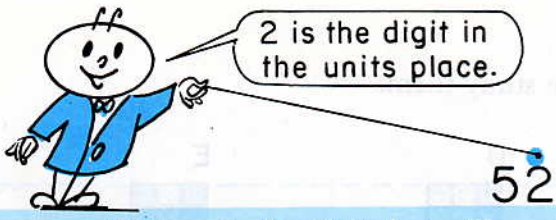
(1) 48¢ (3) 60¢
(2) 12¢ (4) 8¢

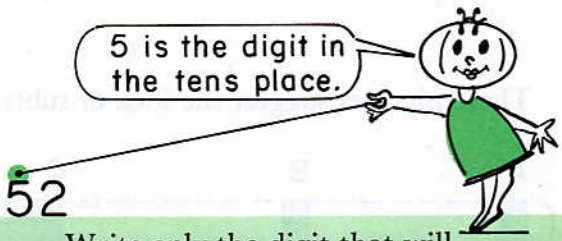
1 2 3 4 ○○○○ _____

12 Together Al and Ed bought 5 sandwiches, one of each kind. They bought 2 cartons of milk. How much did they spend?

(1) $1.02 (3) $1.10
(2) 98¢ (4) $1.21

1 2 3 4 ○○○○ _____





Write only the digit that will be in the units place of the sum.

	A	B	C	D	E
I	11 + 4 = 5	18 + 2 = 0	17 + 5 = 2	18 + 1 =	16 + 14 =
II	13 + 7 =	16 + 6 =	12 + 7 =	18 + 7 =	13 + 19 =
III	17 + 29 =	33 + 24 =	29 + 39 =	50 + 39 =	48 + 49 =

Write only the digit that will be in the tens place of the sum.

	F	G	H	I	J
I	11 + 4 = 1	18 + 2 = 2	17 + 5 = 2	18 + 1 =	16 + 14 =
II	13 + 7 =	16 + 6 =	12 + 7 =	18 + 7 =	13 + 19 =
III	17 + 29 =	33 + 24 =	29 + 39 =	50 + 39 =	48 + 49 =

Find the sums.

	K	L	M	N	O
IV	11 + 4 = 15	18 + 2 = 20	17 + 5 = 22	18 + 1 =	16 + 14 =
V	13 + 7 =	16 + 6 =	12 + 7 =	18 + 7 =	13 + 19 =
VI	17 + 29 =	33 + 24 =	29 + 39 =	50 + 39 =	48 + 49 =

What Are My Rules?

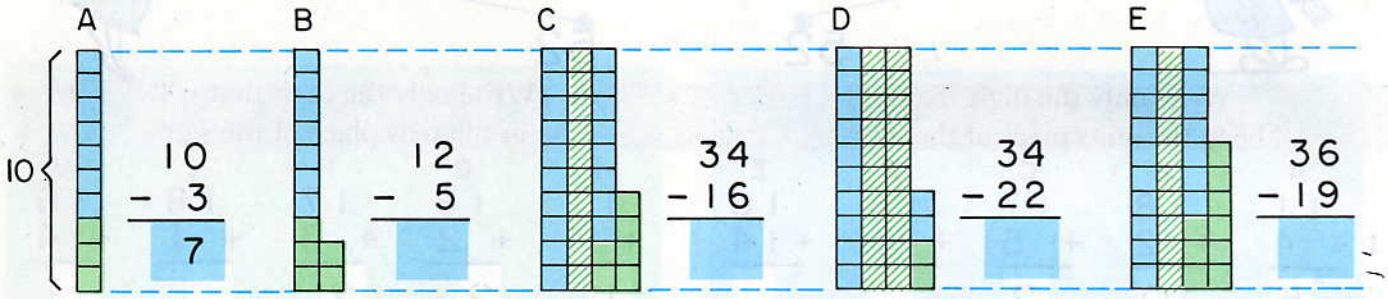
I.

5	5	10
1	6	7
14	0	14
6	3	
7	8	
9		20
	20	30
13		27
	$\frac{1}{2}$	1

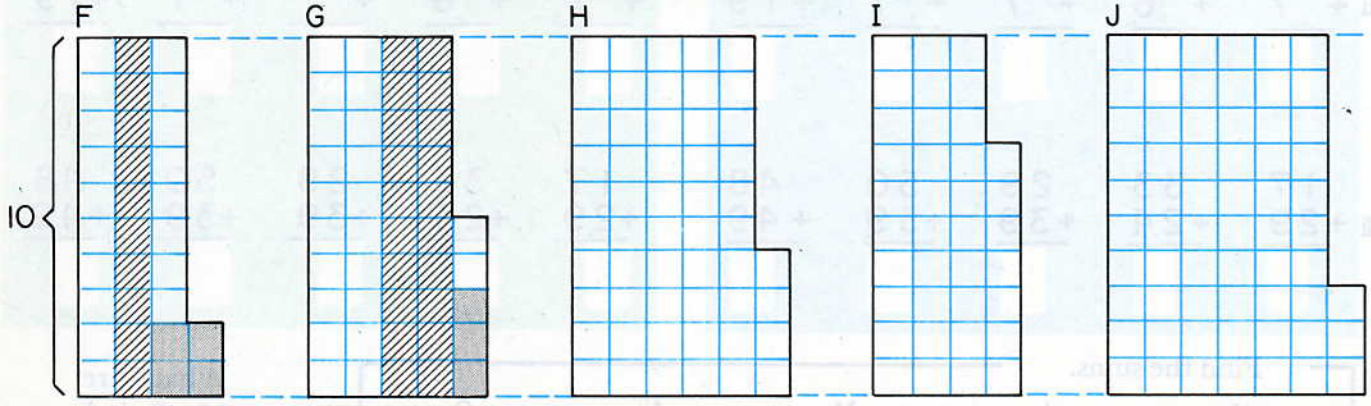
II.

5	9	14	12	20	31				21		100		y
2	6	11				16	27	0		43		200	y − 3

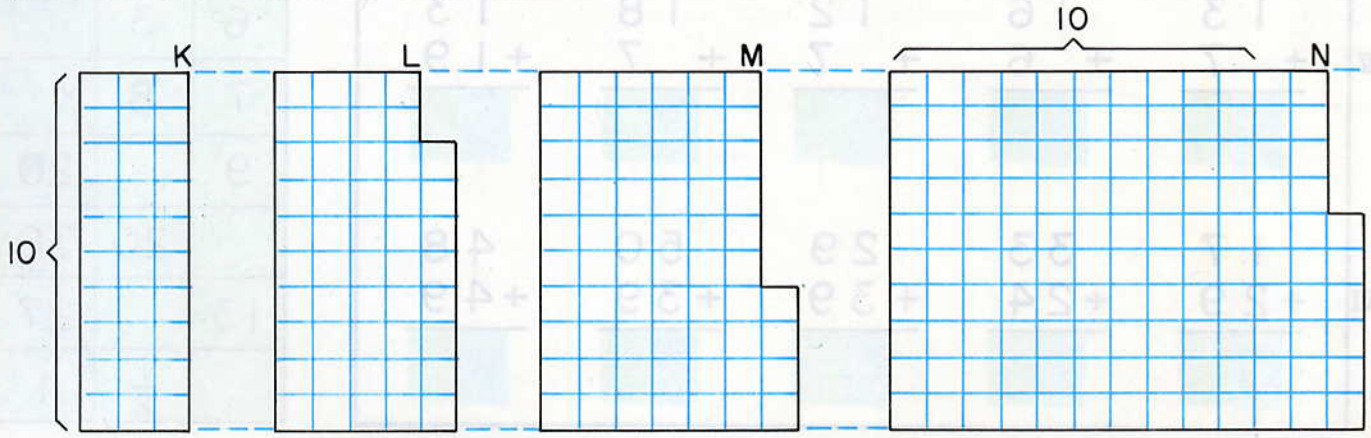
These pictures suggest the idea of subtraction. Please study them.



Complete the sketches below.
Are enough clues given?

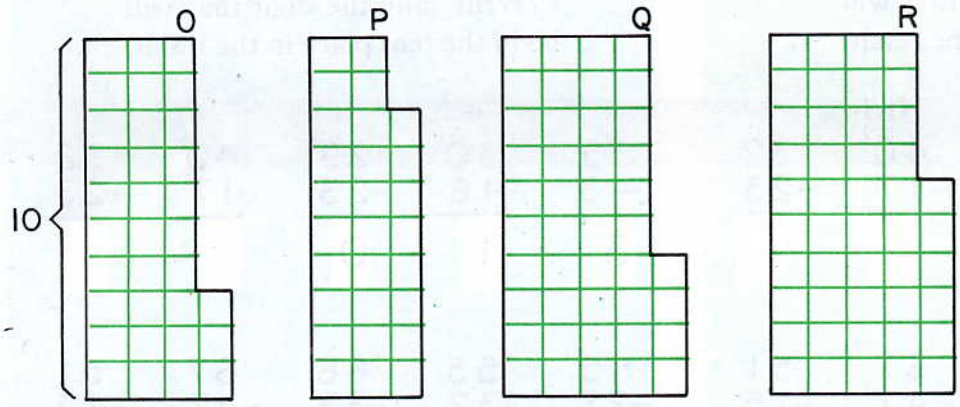


$\begin{array}{r} 32 \\ -\,14 \\ \hline \end{array}$ $\begin{array}{r} 45 \\ -\,23 \\ \hline \end{array}$ $\begin{array}{r} \\ -\,27 \\ \hline \end{array}$ $\begin{array}{r} \\ -\,18 \\ \hline \end{array}$ $\begin{array}{r} \\ -\,29 \\ \hline \end{array}$



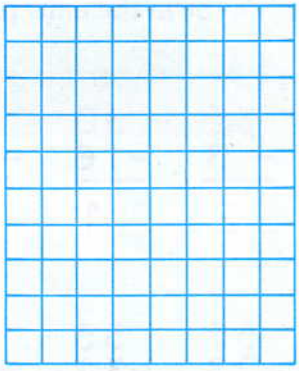
$\begin{array}{r} \\ -\,14 \\ \hline \end{array}$ $\begin{array}{r} \\ -\,26 \\ \hline \end{array}$ $\begin{array}{r} \\ -\,35 \\ \hline \end{array}$ $\begin{array}{r} \\ -\,39 \\ \hline \end{array}$

This page is very much like the last one. Please complete the sketches.

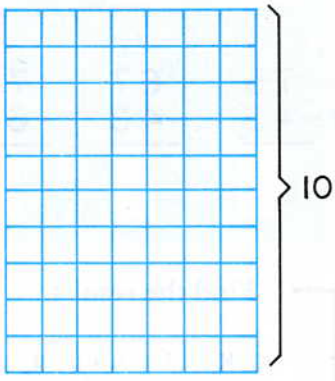


$$\begin{array}{r} 33 \\ -\ 8 \\ \hline \end{array} \qquad 33 - 14 = \qquad 33 - 27 = \qquad 33 - 19 =$$

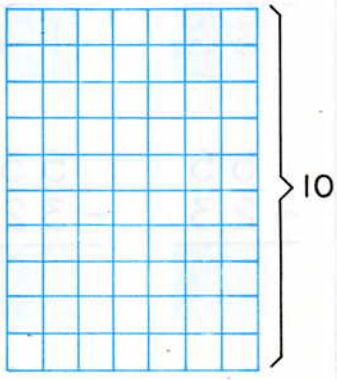
(Draw sketches if you need to.)

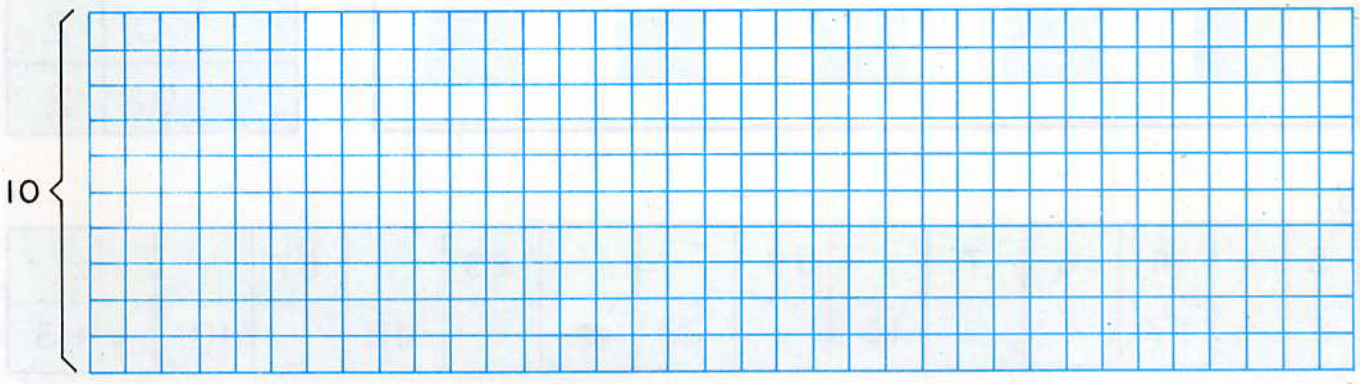


Complete the following subtraction problems. Draw sketches if you need to.



(a) $23 - 8 =$	(b) $30 - 14 =$	(c) $57 - 30 =$	(d) $70 - 9 =$	(e) $90 - 20 =$
(f) $35 - 15 =$	(g) $26 - 12 =$	(h) $40 - 26 =$	(i) $33 - 18 =$	(j) $78 - 25 =$
(k) $50 - 25 =$	(l) $88 - 44 =$	(m) $32 - 19 =$	(n) $27 - 27 =$	(o) $31 - 13 =$





Write only the digit that will be in the units place in the result.

	A	B	C	D	E
I	35 − 3 = 2	30 − 16 = 4	29 − 23 =	40 − 17 =	32 − 23 =
II	55 − 23 =	55 − 32 =	66 − 33 =	67 − 47 =	51 − 15 =
III	75 − 43 =	67 − 48 =	75 − 65 =	95 − 84 =	98 − 89 =

Write only the digit that will be in the tens place in the result.

	F	G	H	I	J
I	35 − 3 = 3	30 − 16 = 1	29 − 23 = 0	40 − 17 =	32 − 23 =
II	55 − 23 =	55 − 32 =	66 − 33 =	67 − 47 =	51 − 15 =
III	75 − 43 =	67 − 48 =	75 − 65 =	95 − 84 =	98 − 89 =

Find the results.

	K	L	M	N	O
IV	35 − 3 = 32	30 − 16 = 14	29 − 23 =	40 − 17 =	32 − 23 =
V	55 − 23 =	55 − 32 =	66 − 33 =	67 − 47 =	51 − 15 =
VI	75 − 43 =	67 − 48 =	75 − 65 =	95 − 84 =	98 − 89 =

What Are My Rules?

I.

4	2	2
8	6	2
10	8	2
6	4	
9		2
	10	2
15	13	
31		2
	0	2
	98	2

II.

5	1	14	6	7		19			29		57		x
8	4	17			16		23	3		42		101	x + 3

Write only the digit that will be in the units place in the result.

	A	B	C	D	E
I	13 + 18	49 − 12	52 − 11	24 + 19	53 − 6
	1	7	1		
II	19 + 28	65 − 12	92 − 33	27 + 34	99 − 32
III	56 + 15	89 − 16	91 − 12	14 + 69	100 − 13

Write only the digit that will be in the tens place in the result.

	F	G	H	I	J
	13 + 18	49 − 12	52 − 11	24 + 19	53 − 6
II	19 + 28	65 − 12	92 − 33	27 + 34	99 − 32
III	56 + 15	89 − 16	91 − 12	14 + 69	100 − 13

Find the results.

	K	L	M	N	O
IV	13 + 18	49 − 12	52 − 11	24 + 19	53 − 6
V	19 + 28	65 − 12	92 − 33	27 + 34	99 − 32
VI	56 + 15	89 − 16	91 − 12	14 + 69	100 − 13

What Are My Rules?

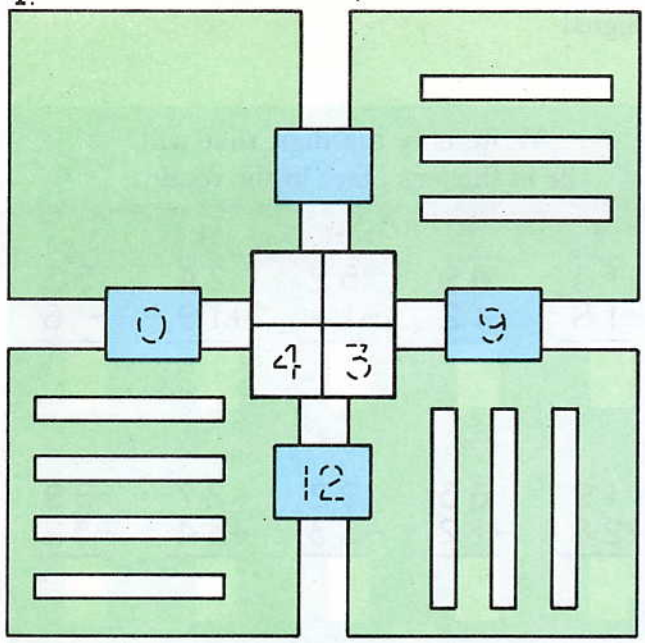
I.

9	1	10
5	5	10
10	0	10
6	4	
1		10
	8	10
7	3	
4		10
	0	10
3		10

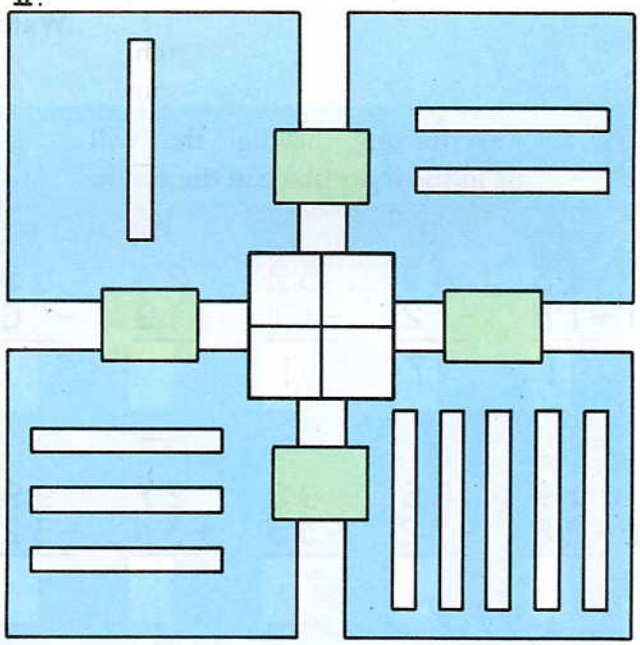
II.

2	10	5	4		3		11		17		57		x
12	20	15		16		17		23		10		109	x + 10

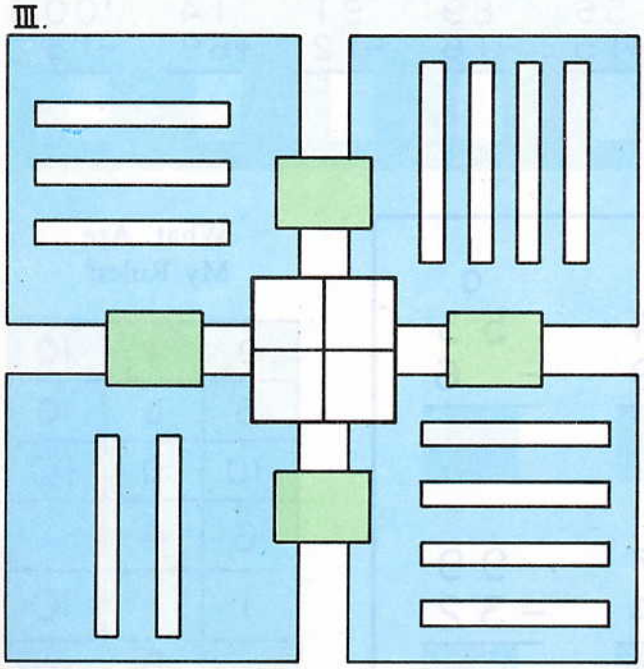
I. What Are My Rules?



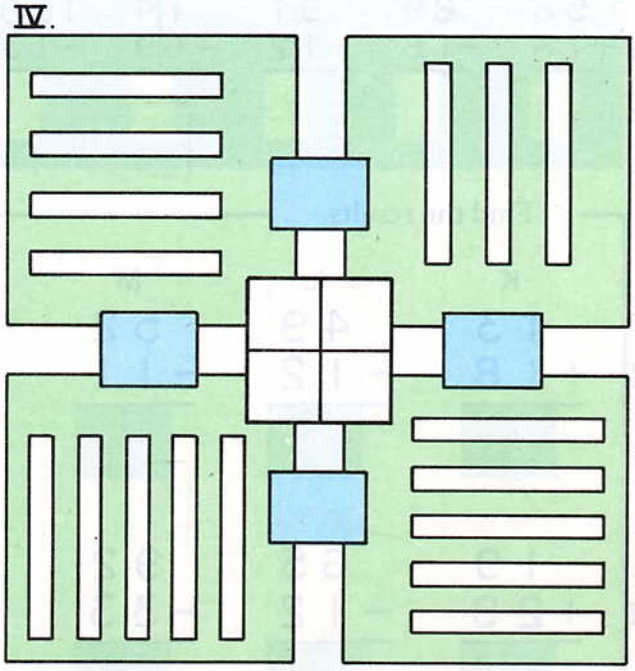
II.



III.



IV.

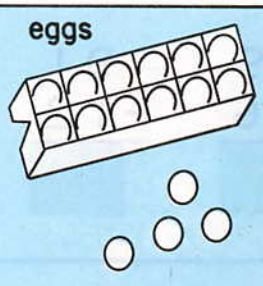


V.

Fewest Coins — dimes and pennies.

twice as much	
____ d., ____ p.	
half as much	
____ d., ____ p.	
3 times as much	4 times as much
____ d., ____ p.	____ d., ____ p.

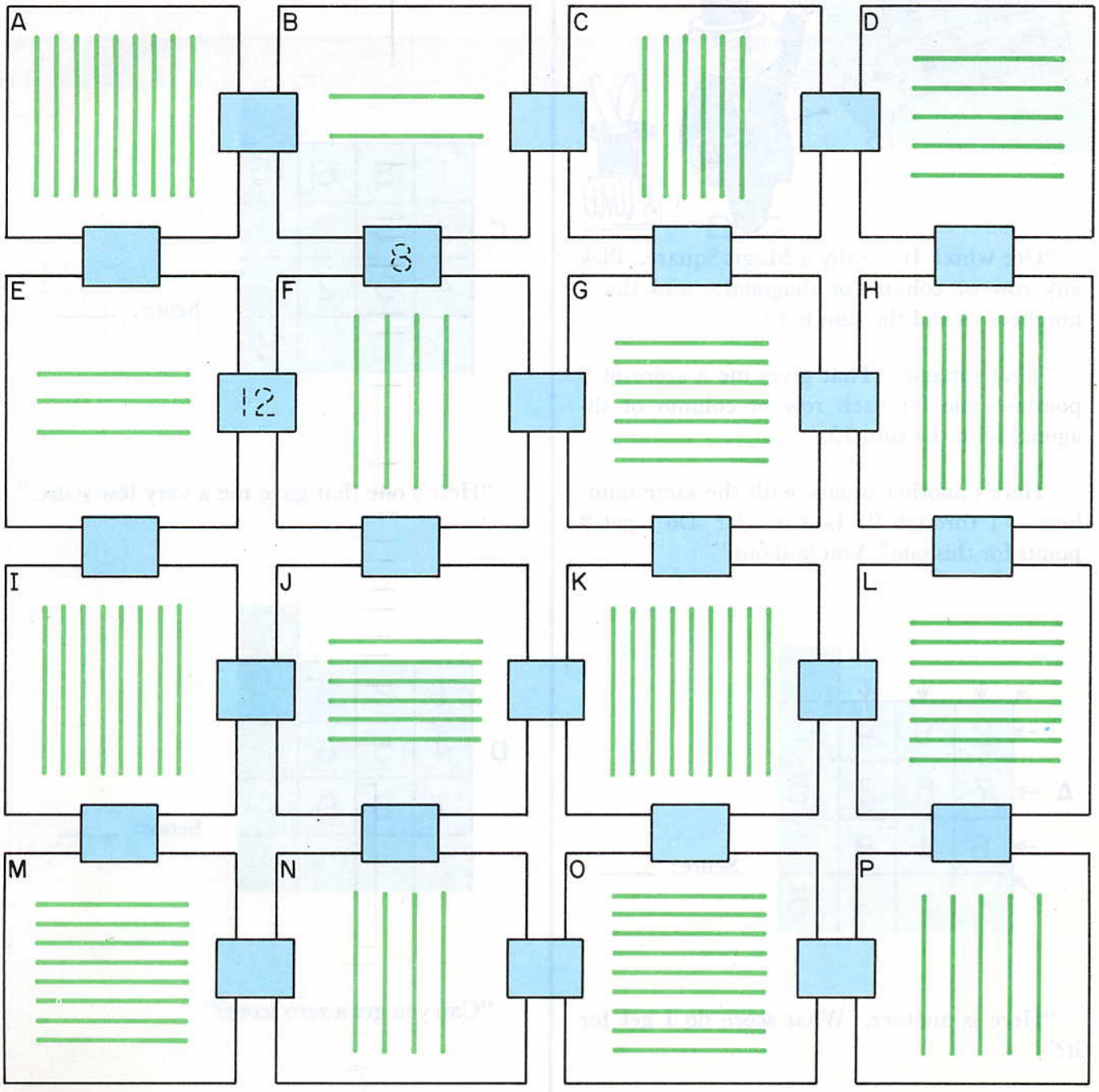
VI.



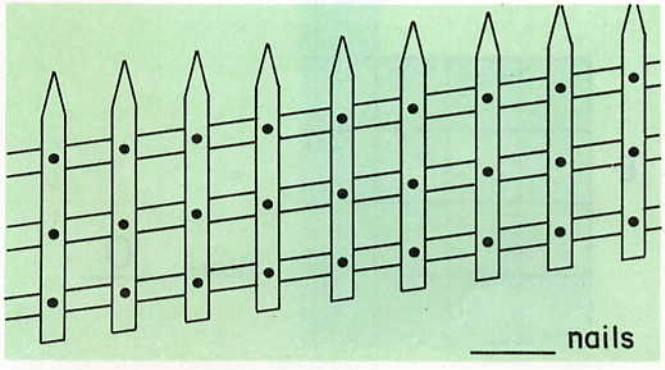
Fewest Units — dozens and eggs.

twice as many	
____ doz., ____ eggs	
half as many	
____ doz., ____ eggs	
3 times as many	4 times as many
____ doz., ____ eggs	____ doz., ____ eggs

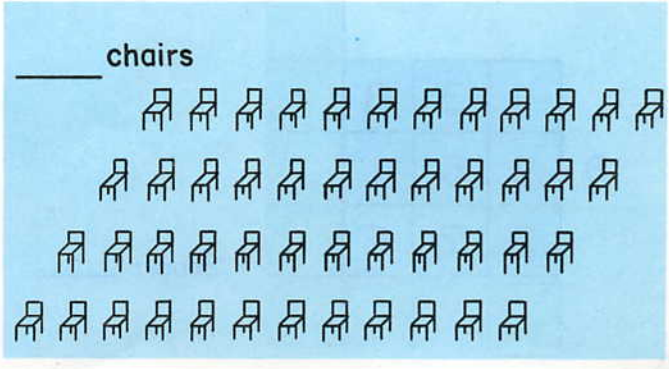
You may need a piece of scratch paper to see what happens when the lines cross in some of the examples.

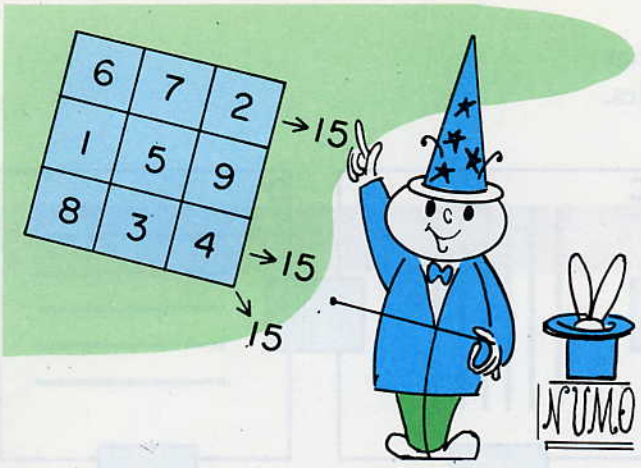


I



II





"Gee whiz! It's really a Magic Square. Pick any row or column or diagonal: add the 3 numbers — and the sum is 15.

"That's magic! That gives me a score of 8 points — one for each row or column or diagonal with the sum 15.

"Here's another square with the same numbers — 1 through 9. Is it magic? Do I get 8 points for this one? You find out."

A

2	9	4	
7	5	3	15
6	1	8	
			15

Score: ____

"Here is another. What score do I get for it?"

B

4	3	8	
9	5	1	
2	7	6	

Score: ____

"Some squares are not magic all the way; so, I wouldn't get 8 points for them. How many points would you give me for this one?"

C

1	8	6	15
3	5	7	
4	9	2	
			8

Score: ____

"Here's one that gave me a very low score."

D

1	2	3	
4	5	6	
7	8	9	

Score: ____

"Can you get a zero score?"

E

Score: 0

"What score do I get for these squares?"

F

8	1	5
3	6	7
4	9	2

Score: ____

G

2	9	4
3	5	7
6	1	8

Score: ____

H

2	7	6
5	9	1
4	3	8

Score: ____

When Numo gets tired of using only the numbers 1 through 9, he tries other groups of numbers.

"Once I tried odd numbers. Here is my work. What's my score?"

I

9	1	11
5	15	13
7	17	3

Score: ____

"That's a low score! I counted the number of times I got 27. That was low. I counted the times I got 33. That was no better. I tried again:

J

3	13	11
17	9	1
7	5	15

Score: ____

"That's a better score."

"Next, I tried even numbers and got a perfect score of 8. Can you finish the square as I did?"

K

	6	
	10	
4	14	12

Score: 8

"Next, I jumped around in picking my numbers. What score would you give me?"

L

11	7	4
1	8	15
12	9	5

Score: ____

"Can you use these same 9 numbers to get a perfect score?" _____

All About Coins

Find the 6 ways to make 18¢ with coins. In keeping track, you quickly learn the shorthand we use.

How many coins are there in each of the ways to make 18¢?

18¢

0 d, 0 n, 18 p. (or 18 coins)

1 d, 0 n, 8 p. (or 9 coins)

0 d, 3 n, 3 p. (or ____ coins)

0 d, 2 n, ____ p. (or ____ coins)

0 d, 1 n, ____ p. (or ____ coins)

____ d, 1 n, 3 p. (or ____ coins)

Notice that only 5 coins were required in the last combination. We say that 5 coins are the "fewest coins" needed to make 18¢.

FEWEST COINS

Show how the amounts given could be made with the fewest coins.

14¢ ..... 1 d, 0 n, ____ p.

7¢ ..... ____ d, ____ n, ____ p.

16¢ ..... ____ d, ____ n, ____ p.

20¢ ..... ____ d, ____ n, ____ p.

24¢ ..... ____ d, ____ n, ____ p.

More About Fewest Coins

1. Show how the amounts in the blue blocks can be made with the fewest coins.
2. Find the sum of the amounts shown in the blue blocks.
3. Then show the fewest coins needed to make this amount.

A.

8¢ ..... 0 d, ____ n, ____ p.

\+ 7¢ ..... 0 d, ____ n, ____ p.

15¢ ..... 1 d, ____ n, ____ p.

B.

9¢ ..... ____ d, ____ n, ____ p.

\+ 12¢ ..... ____ d, ____ n, ____ p.

¢ ..... ____ d, ____ n, ____ p.

C.

6¢ ..... ____ d, ____ n, ____ p.

\+ 16¢ ..... ____ d, ____ n, ____ p.

¢ ..... ____ d, ____ n, ____ p.

D.

15¢ ..... ____ d, ____ n, ____ p.

\+ 9¢ ..... ____ d, ____ n, ____ p.

¢ ..... ____ d, ____ n, ____ p.

Problem: Can you find any amount less than 25¢ which can be made by the same number of coins in two different ways? ____

More About Coins

Show each amount in the fewest dimes and pennies.

8¢	0 d, 8 p	25¢	___ d, 5 p
13¢	1 d, ___ p	10¢	___ d, ___ p
21¢	___ d, ___ p	36¢	___ d, ___ p
59¢	___ d, ___ p	82¢	___ d, ___ p

Find the Sums.

Use the fewest dimes and pennies for each amount.

A
14¢ 1 d, 4 p
+ 8¢ 0 d, 8 p
22¢ 2 d, ___ p

B
20¢ ___ d, ___ p
+ 13¢ 1 d, 3 p
¢ ___ d, ___ p

C
¢ 2 d, 5 p
+ 6¢ ___ d, ___ p
¢ ___ d, ___ p

D
48¢ ___ d, ___ p
+ 12¢ ___ d, ___ p
¢ ___ d, ___ p

E
¢ 1 d, 8 p
+ ¢ 1 d, 7 p
¢ ___ d, ___ p

F
¢ 3 d, 7 p
+ ¢ 2 d, 6 p
¢ ___ d, ___ p

Find the Differences.

G
30¢ 3 d, 0 p
− 12¢ 1 d, 2 p
18¢ ___ d, ___ p

H
¢ 2 d, 5 p
− ¢ 0 d, 7 p
¢ ___ d, ___ p

I
¢ 4 d, 7 p
− 23¢ ___ d, ___ p
¢ ___ d, ___ p

J
29¢ ___ d, ___ p
− ¢ 0 d, 9 p
¢ ___ d, ___ p

K
37¢ ___ d, ___ p
− 18¢ ___ d, ___ p
¢ ___ d, ___ p

L
¢ 5 d, 6 p
− ¢ 2 d, 9 p
¢ ___ d, ___ p

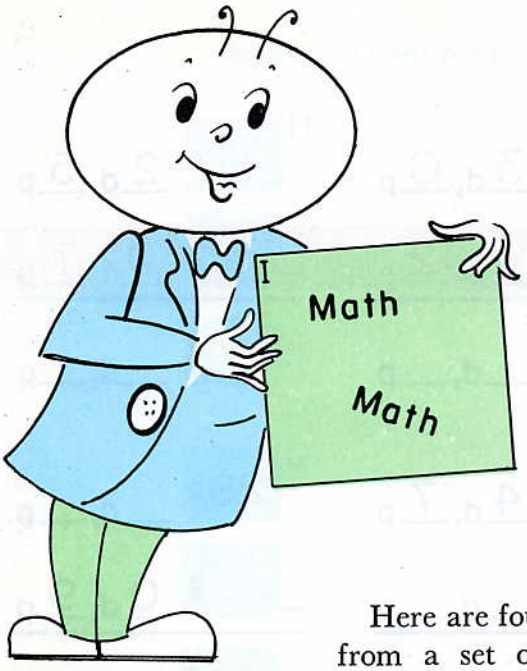
M
¢ 8 d, 1 p
− ¢ 3 d, 4 p
¢ ___ d, ___ p

N
70¢ ___ d, ___ p
− 47¢ ___ d, ___ p
¢ ___ d, ___ p

Find the Sums.

O
¢ 1 d, 8 p
¢ 3 d, 6 p
+ ¢ 2 d, 5 p
¢ ___ d, ___ p

P
47¢ ___ d, ___ p
19¢ ___ d, ___ p
+ 5¢ ___ d, ___ p
¢ ___ d, ___ p



Here are four cards from a set of cards made by Numo, the number-explainer.

He calls them his W-A-M-R cards. That's his shorthand for "What-Are-My-Rules?"

Here is what you will find on the backs of those cards.

BACK

Rule A	Rule B
1	2
Rule C	Rule D
	4

BACK

Rule A	Rule B
3	
Rule C	Rule D
9	12

BACK

Rule A	Rule B
	8
Rule C	Rule D
12	16

BACK

Rule A	Rule B
2	4
Rule C	Rule D
6	

Can you find the back which goes with each card above? Can you fill in the missing numbers?

FRONT

II
Math

FRONT

III
Math
Math
Math
Math

FRONT

IV
Math
Math
Math

Here are some more cards from this set. You fill in the boxes.

FRONT

V
Math
Math
Math
Math

BACK	
Rule A	Rule B
5	10
Rule C	Rule D
	20

FRONT

VI

BACK	
Rule A	Rule B
0	0
Rule C	Rule D

FRONT

VII
Math
Math
Math
Math
Math
Math
Math
Math
Math
Math

BACK	
Rule A	Rule B
Rule C	Rule D

FRONT

VIII
Math
Math
Math
Math

BACK	
Rule A	Rule B
Rule C	Rule D
	24

WAMR ... Set A

A

FRONT	BACK
4	7
3	1

B

FRONT	BACK
7	9
2	5

C

10	
4	6

D

20	25
5	

E

17	
3	14

F

FRONT	BACK
16	22

G

12	20

H

16	
7	

I

30	
	20

J

8	12

K

	42
10	

L

	7
	3

M

	21
9	

N

	16
	0

O

	15
	5

WAMR... Set B

What Are My Rules?

U

FRONT	BACK	
	Rule A	Rule B
4¢ each or 2 for 7¢	4¢	7¢
	Rule C	Rule D
	11¢	14¢

V

	Rule A	Rule B
2¢ each or 3 for 5¢	2¢	4¢
	Rule C	Rule D
	5¢	7¢

W

FRONT	BACK	
	Rule A	Rule B
3¢ each or 2 for 5¢	¢	¢
	Rule C	Rule D
	¢	¢

X

	Rule A	Rule B
4¢ each or 3 for 10¢	¢	
	Rule C	Rule D

Y

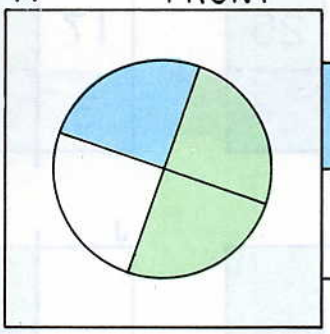
	Rule A	Rule B
6¢ each or 3 for _____¢	¢	
	Rule C	Rule D
		21¢

Z

	Rule A	Rule B
_____¢ each or 3 for _____¢		10¢
	Rule C	Rule D
		18¢

WAMR... Set C

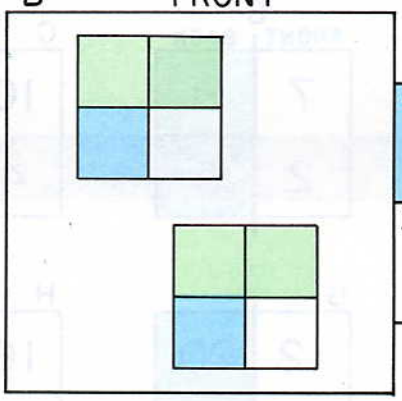
A FRONT



BACK

Rule I	Rule II
1	2
Rule III	Rule IV
3	4

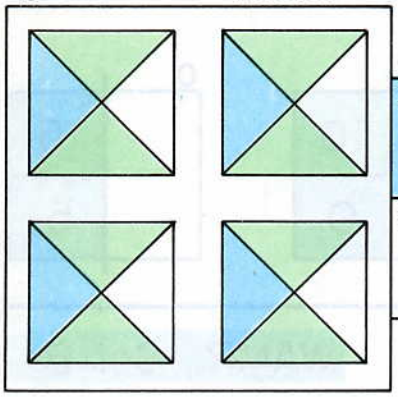
B FRONT



BACK

I	II
2	
III	IV
6	8

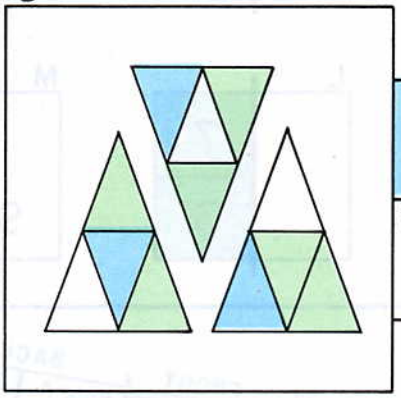
C FRONT



BACK

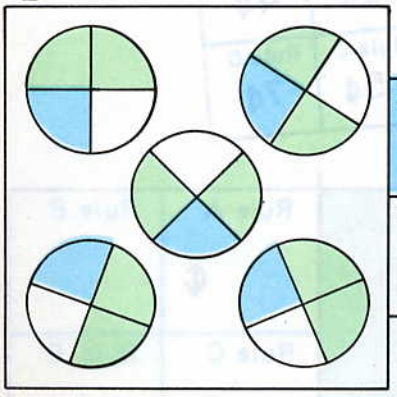
I	II
4	
III	IV

D



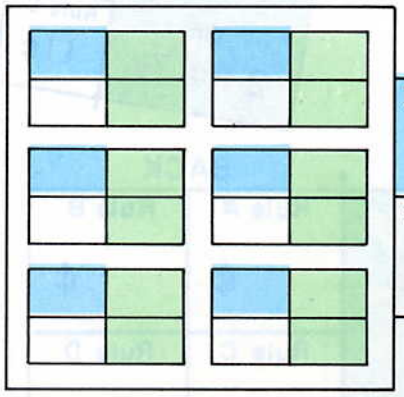
I	II
	6
III	IV

E



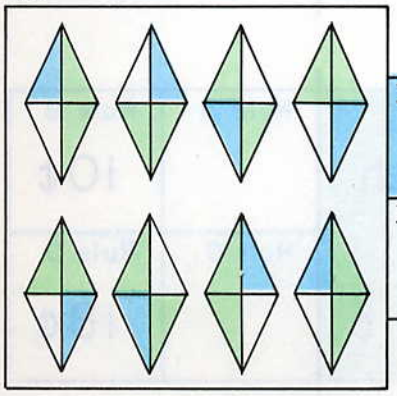
I	II
III	IV

F



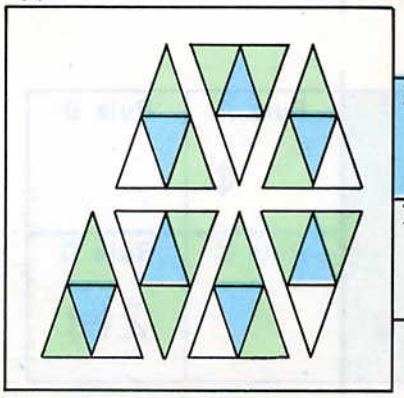
I	II
III	IV

G



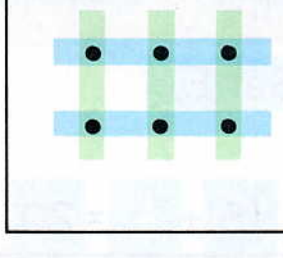
I	II
III	IV

H



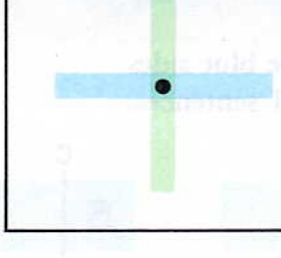
I	II
III	IV

A



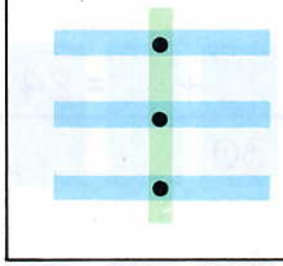
FRONT	BACK	
	Rule I: 5	Rule II: 6
	Rule III: 10	Rule IV

B



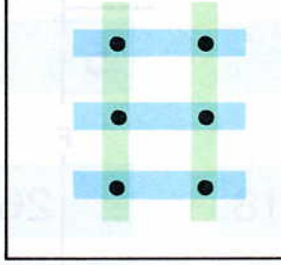
FRONT	BACK	
	Rule I: 2	Rule II: 1
	Rule III	Rule IV: 2

C



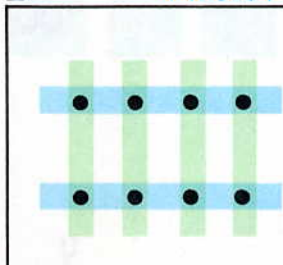
FRONT	BACK	
	Rule I: 4	Rule II: 3
	Rule III	Rule IV

D



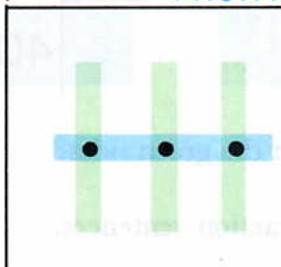
FRONT	BACK	
	I	II
	III	IV

E



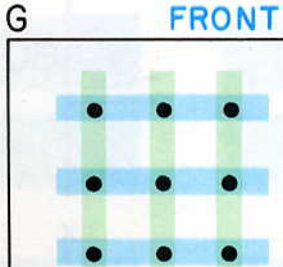
FRONT	BACK	
	I	II
	III: 12	IV: 16

F



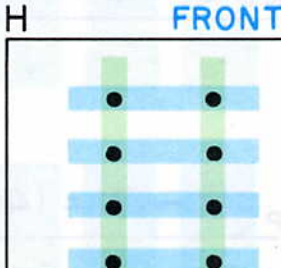
FRONT	BACK	
	I	II
	III	IV: 6

G



FRONT	BACK	
	I	II
	III	IV

H



FRONT	BACK	
	I	II
	III	IV

Another game of What's My Rule?

a	b	c	d	e	f	g	h	i	j	k	l
8	13	11	20	15		20	50			50	m
5	13	4	10		3	9		20	15	24	n
3	0			4	9		40	30	35		m−n

What's My Rule?

2	4	0	0	3	6	1	2	4	8
6		5			20	8		7			30		100

Select cards so that the blue sides make true mathematical sentences.

WAMR... Set E

A

2	4
+ 3	6
5	

B

6	
+ 4	

C

5	
+	
5	

D

6	
+	
15	

E

	18
+	12

F

	26
+	
	40

G $8 + 7 = \square$, $\square = 16$

H $15 + \square = 20$

I $\square + 15 = \square$, $\square = 42$

J $\square + \square = 24$, $\square = 30$

K $\square + \square = 40$, $\square = 50$

L $\square + 32 = \square$, $\square = 100$

What do you notice about the green sides?

Let's try some subtraction sentences.

M $5 - 2 = \square$, $\square = 10$

N $12 - 8 = \square$

O $20 - \square = 15$

P $\square - 7 = 14$

Q $20 - \square = \square$, $\square = 30$

R $\square - 14 = \square$, $\square = 14$

S

23	
− 17	

T

14	
−	
5	

U

40	
−	60

V

44	
−	36

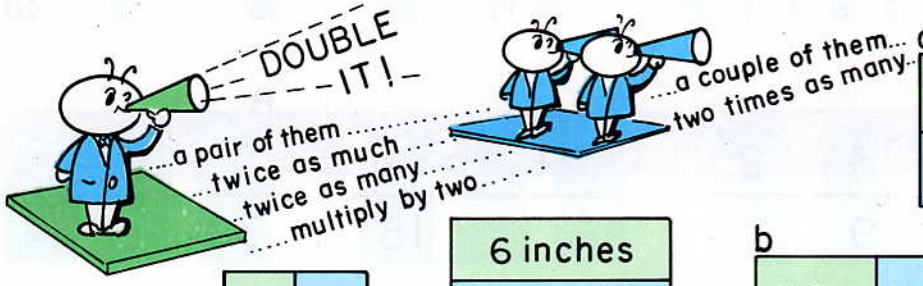
W

37	
−	74

X

	72
−	28

Extra 1, 1, 2, 3, 5, 8, ___, 21, ___, ___, ___, ___, 233



a

5 days
1 week and days

8	16

6 inches
1 foot

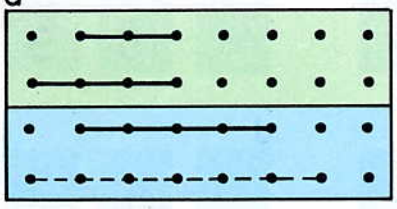
b

15¢	

c

	24¢

d



e

5	

f

	18

g

50

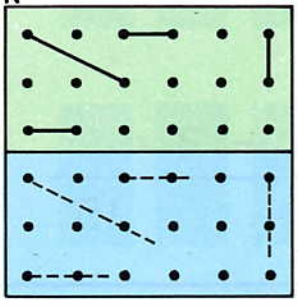
h

8 in.
ft. and in.

i

17 miles	

k



l

200	

m

6 months

j

a rise from 15° to 21°	a rise from 15° to

n

|

o

8 ounces

p

	1 wk. and 5 da.

q

	1 hr. and 10 min.

r

	twenty-two

x

	500

t

25¢

s

	1 doz. eggs

u

A PRICE of 2 for 5¢
A PRICE of ____ for ____

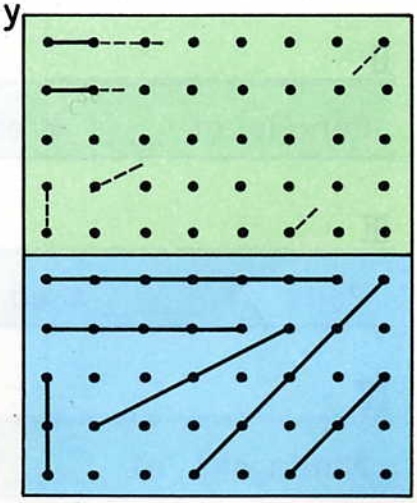
v

1 ft., 10 in.

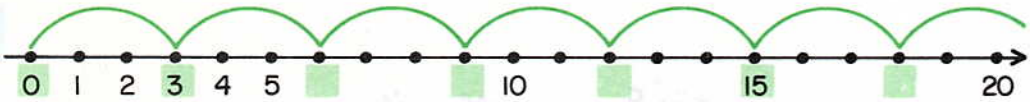
w

75	

y



What's My Rule?



WAMR...Set G

1	0	10	5	3	2
3	0	30	15	9	

A

3 +	=
	18

B

	− 6 =
30	

C

3 + 2 =

D

4 + 0 =

E

+	= 15
15	

F

−	=
15	9

G

5 − 2 =

H

4 −	= 4

I

−	=
12	9

J

+ 4 =
30

K

5 +	= 7

L

− 2 =
15

M

11 +	=
	60

N

−	=
21	21

Pencils 3¢ each

Erasers 2¢ each

Pads of paper 5¢ each

Notebooks 8¢ each

Number purchased

I

Erasers at _____¢ ea.	0	1	2	3	4	5	6
	0 ¢	2 ¢	4 ¢	¢	¢	¢	¢

II

Pencils at _____¢ ea.	0	1	2	3	4	5	6
	¢	¢	6 ¢				

III

Pads at _____¢ ea.	0	1	2	3	4	5	6
	¢	5 ¢					

IV

Notebooks at _____¢ ea.	0	1	2	3	4	5	6

WAMR... Set H

A

FRONT	BACK	
	Rule I	Rule II
	3¢	6¢
	Rule III	Rule IV
	13¢	1¢

B

FRONT	BACK	
	Rule I	Rule II
	6¢	
	Rule III	Rule IV
	16¢	4¢

C

FRONT	BACK	
	I	II
	12¢	24¢
	III	IV
		10¢

D

FRONT	BACK	
	I	II
	III	IV
	35¢	

E

FRONT	BACK	
	I	II
	III	IV

F

FRONT	BACK	
	I	II
	III	IV

G

FRONT	BACK	
	I	II
	III	IV

H

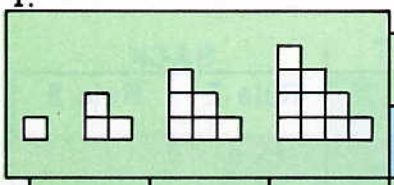
FRONT	BACK	
	I	II
		$1.00
	III	IV

Another game of What's My Rule?

a	b	c	d	e	f	g	h	i	j	k	l
4	10	2	8	9		15	17		14	6	r
3	5	2	2	4	4			25	16		s
7	15	4			10	20	21	30		21	r + s

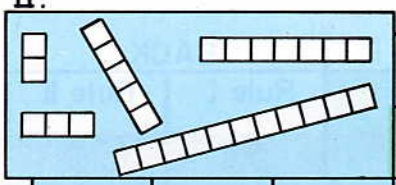
What Are My Rules?

I.



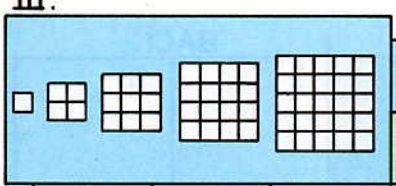
			+15	−6
			35	14
+28	−10			
	10	56	65	5

II.



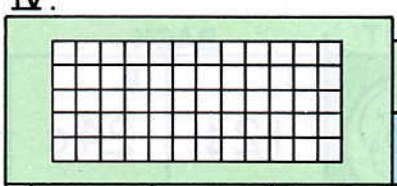
			+13	−11
		+19		+23
45	21		15	

III.



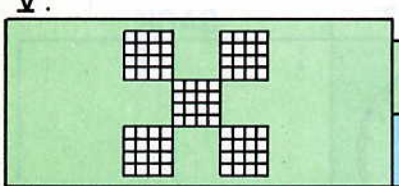
			+36	−25
−16			−49	
	104	119		46

IV.



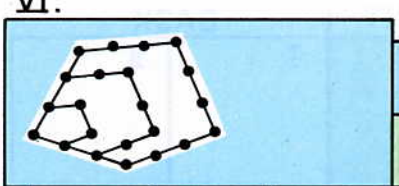
			+18	
				108
	+36			+84
42		48	132	

V.



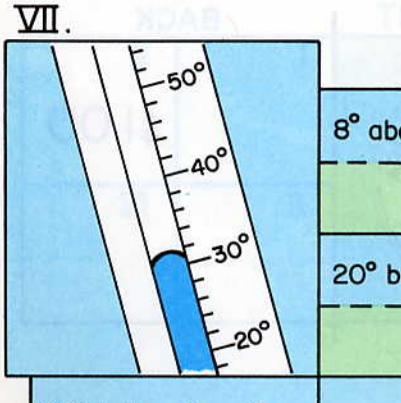
			−24	+32
			56	
		+120	−32	
176	32			240

VI.



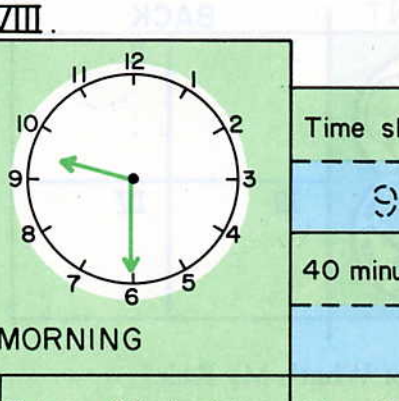
			+13	
			35	51
	+48			
10		5	92	117

VII.



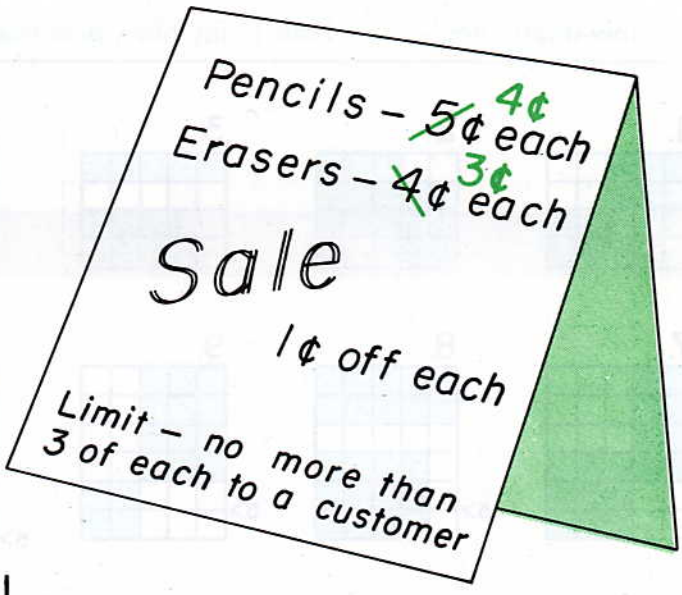
8° above freezing	
40°	
20° below freezing	
32° below freezing	___ above freezing
	72°
67° above freezing	___ above freezing
	212°

VIII.



MORNING	Time shown
	9 : 30 AM
	40 minutes later
	:
3 hrs., 40 min. later	1 hr., 40 min. earlier
:	:
11:55 AM	7:15 PM

Mary's mother gave her a dime to buy a pencil and an eraser. They usually cost 5¢ and 4¢. When she got to the store, she found that there was a sale going on. Here is the sale sign on the right.



a. How much would Mary now spend for a pencil and an eraser? _____

b. If she bought something else, could she spend all of her dime? _____

c. Bill came in the store and asked for 5 pencils. What did the clerk say? _____

_____

d. Alice gave the clerk a dime and a nickel. She received 1¢ change. What did she buy?

_____

e. What is the amount of the smallest purchase in this sale of pencils and erasers? _____

f. What is the amount of the largest sale? _____

_____

g. Frances had a dime and two nickels. She spent as much as she could. How much did she spend? _____

h. What did she buy? _____

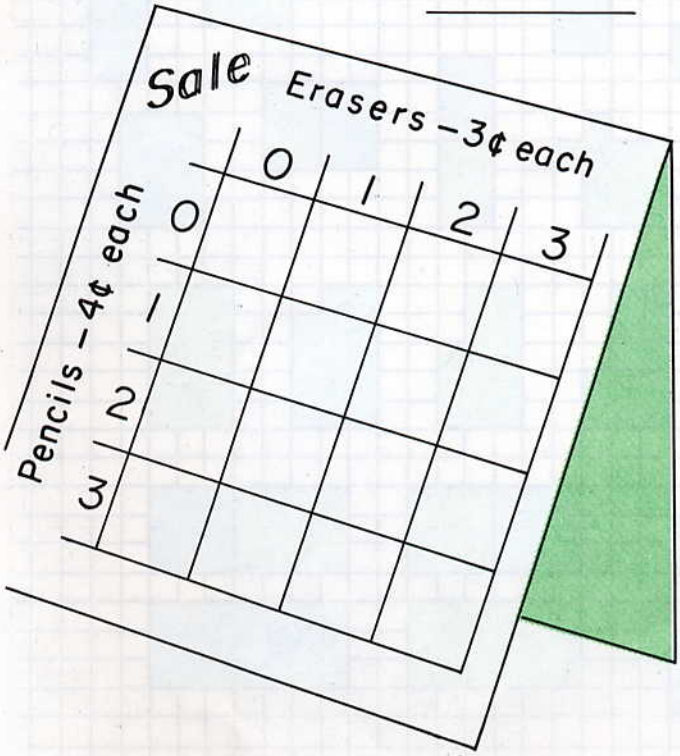
i. Jimmy spent 13¢. What did he buy?

_____

j. Could anyone spend exactly 19¢? _____

k. What purchase amounts to 17¢? _____

_____



On the back of the "Sale" sign, the clerk had worked out a "time saver" chart.

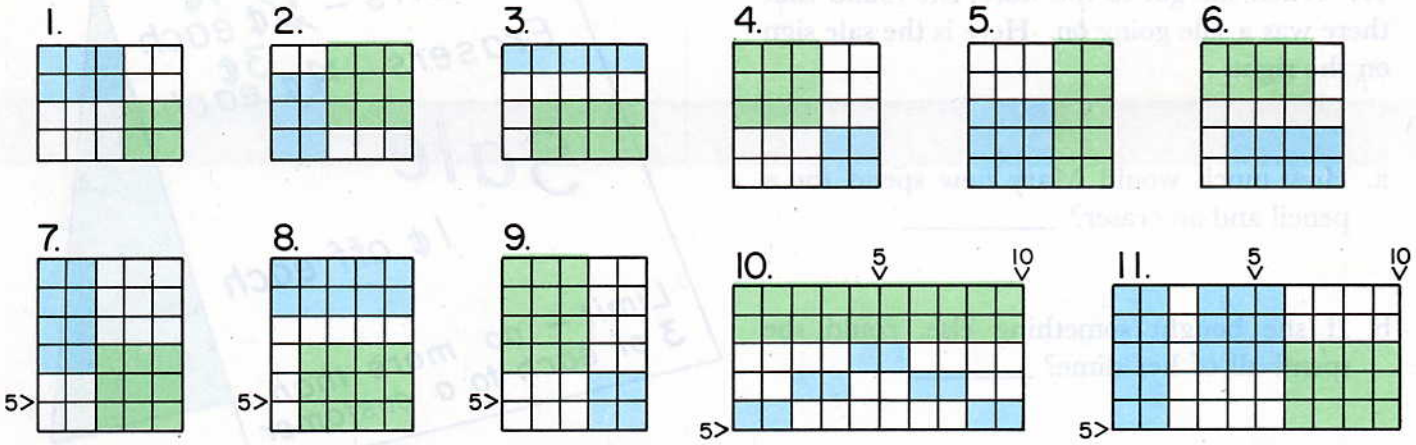
Complete the chart showing all possible purchases using the rule of the sale, as set out in the sign above.

Can you know exactly what was purchased if you know the amount of the purchase?

_____

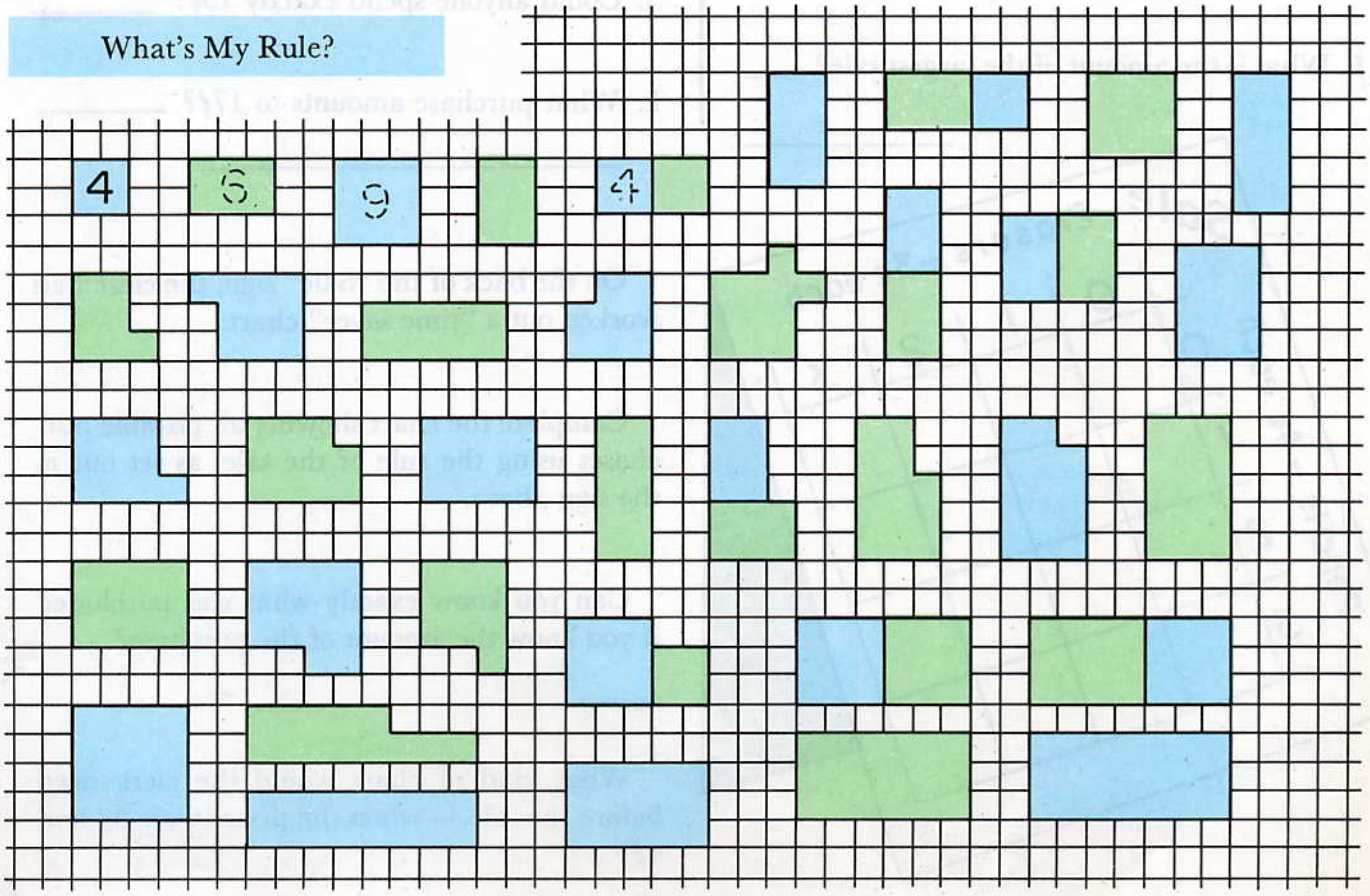
What kind of chart would the clerk need before the sale — when the prices were 5¢ and 4¢?

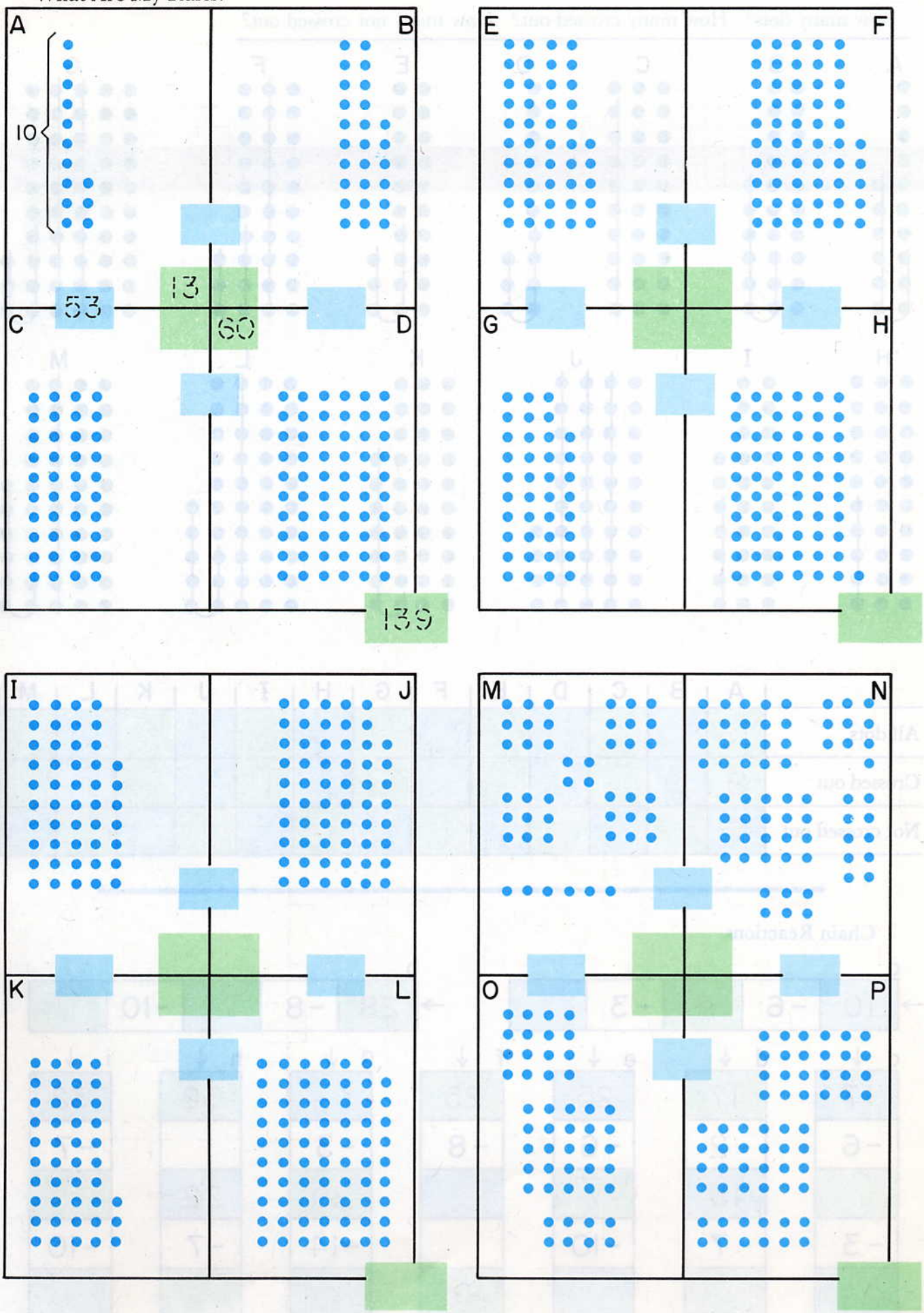
How many tiles? . . . How many blue, how many green, how many white?



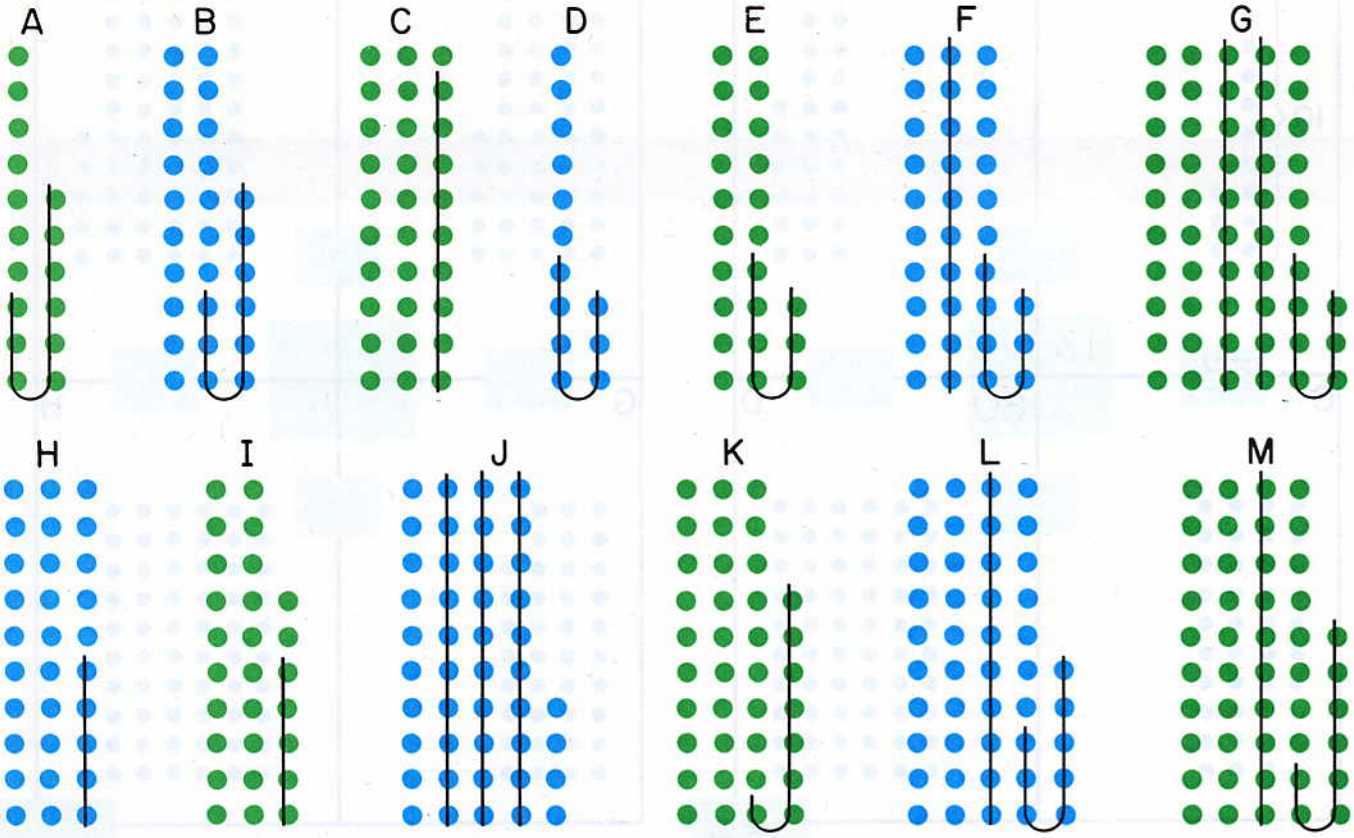
	1	2	3	4	5	6	7	8	9	10	11
Number blue	6										
Number green	4										
All	20										
Blue *or* green	10										
Number white	10										

What's My Rule?



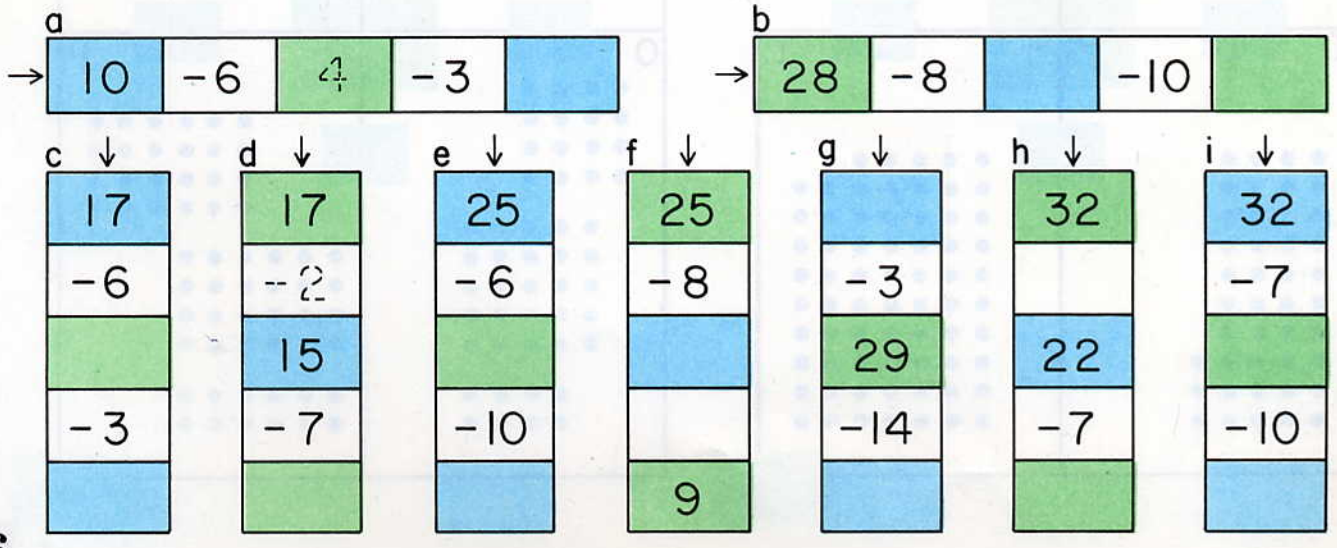

A
B
10
53
13
C
60
D
139
E
F
G
H
I
J
K
L
M
N
O
P

How many dots? How many crossed out? How many not crossed out?

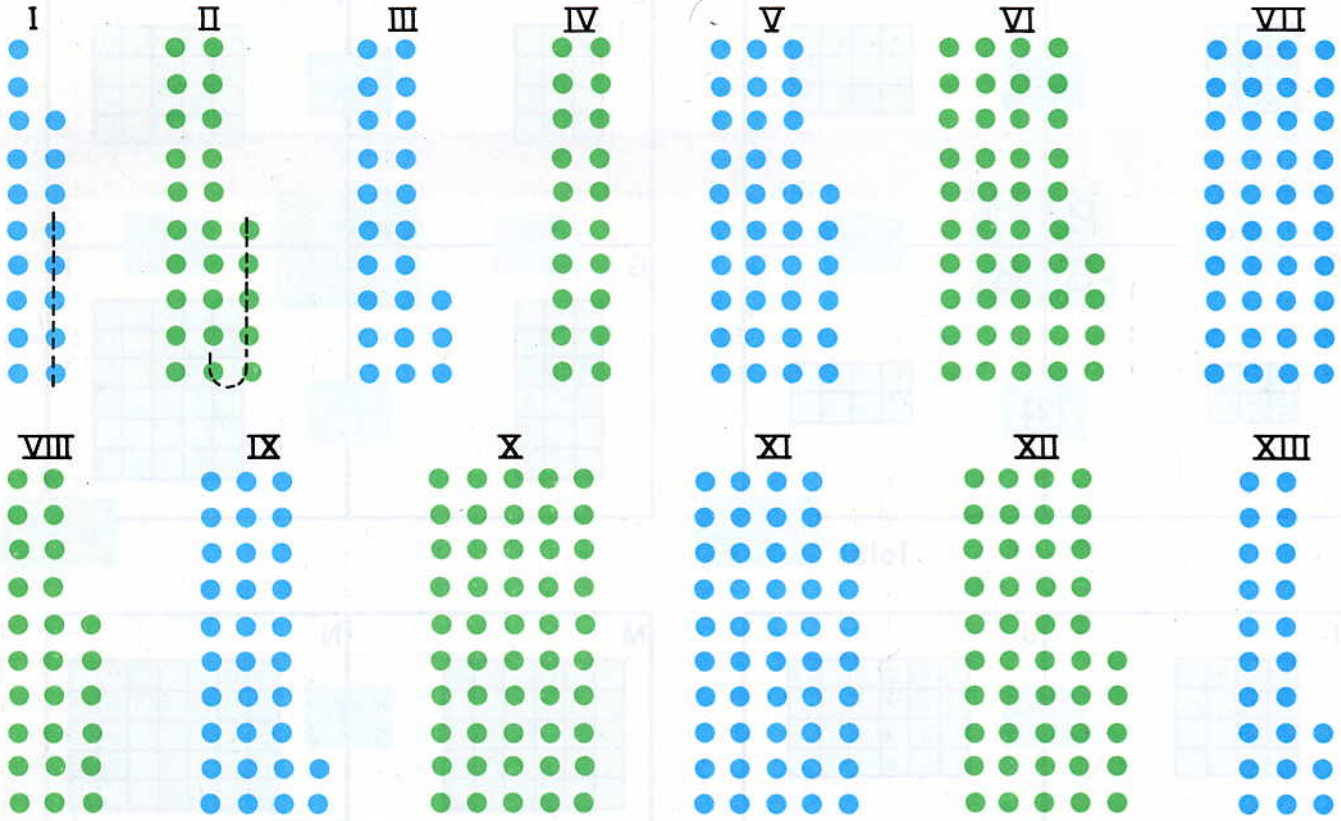


	A	B	C	D	E	F	G	H	I	J	K	L	M
All dots	16												
Crossed out	9												
Not crossed out	7												

Chain Reactions



You cross out the dots. Notice what the record tells you.



	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII
All dots													
Crossed out	5	6	12	11	20	17	13	9	17	24	29	18	15
Not crossed out													

Chain Reactions

A

23	-2		-10	

B

	-1	19		9

C

44
-7
-10

D

40
37
27

E

32
25
-10

F

-4
46
26

G

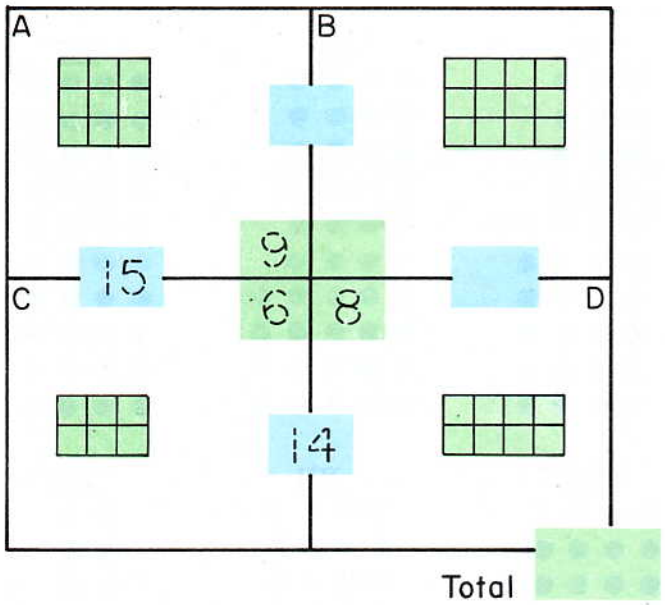
48
39
-20

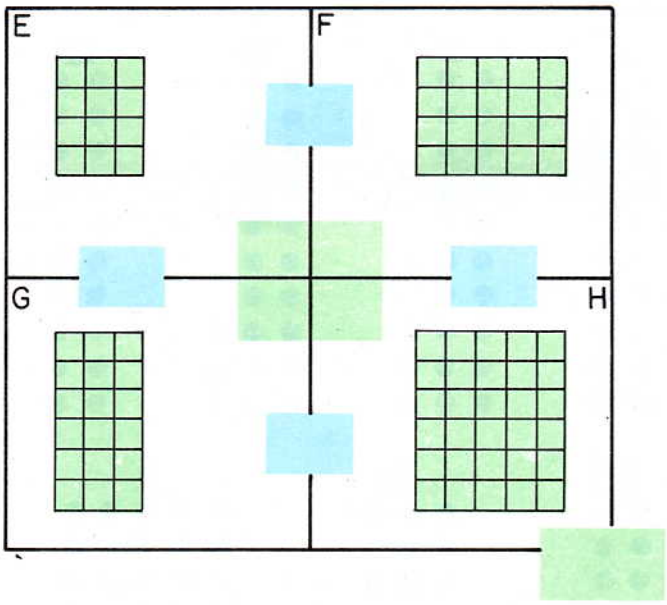
H

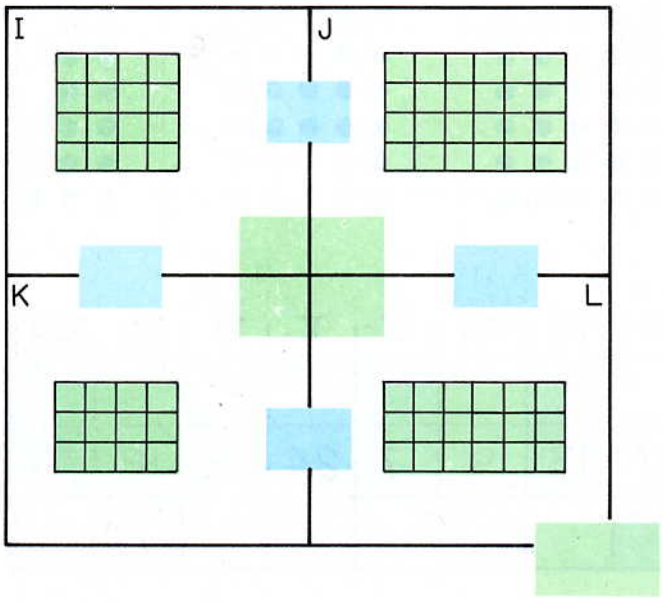
45
-10
27

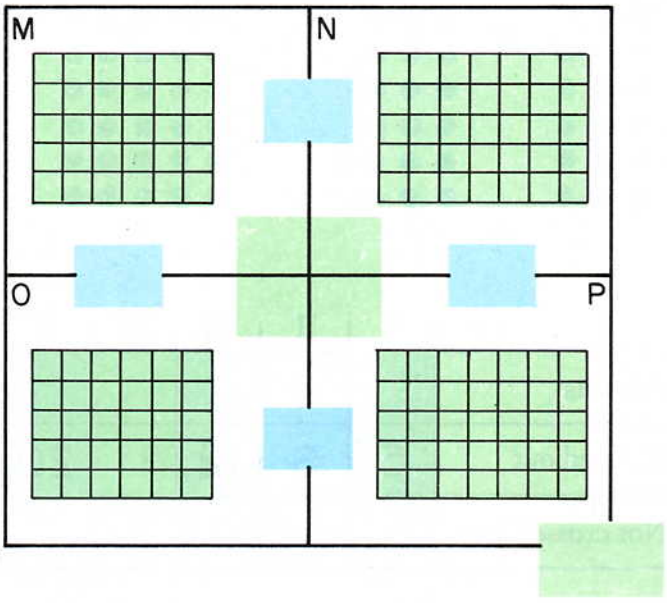
I

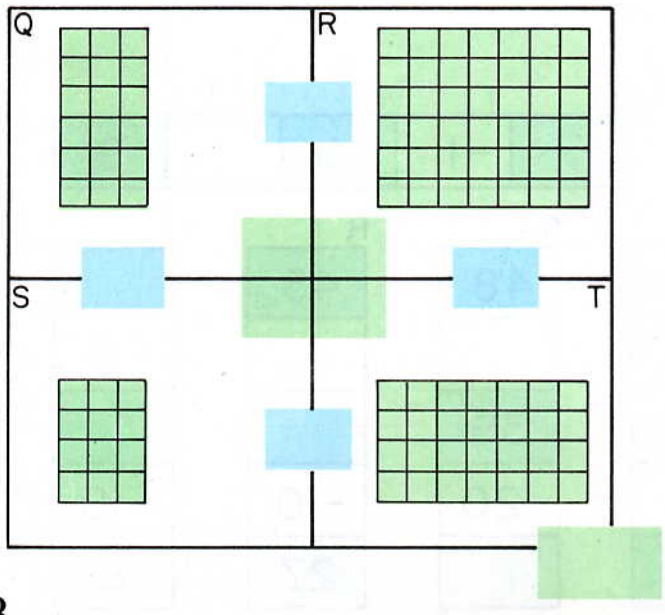
-5
-10
8

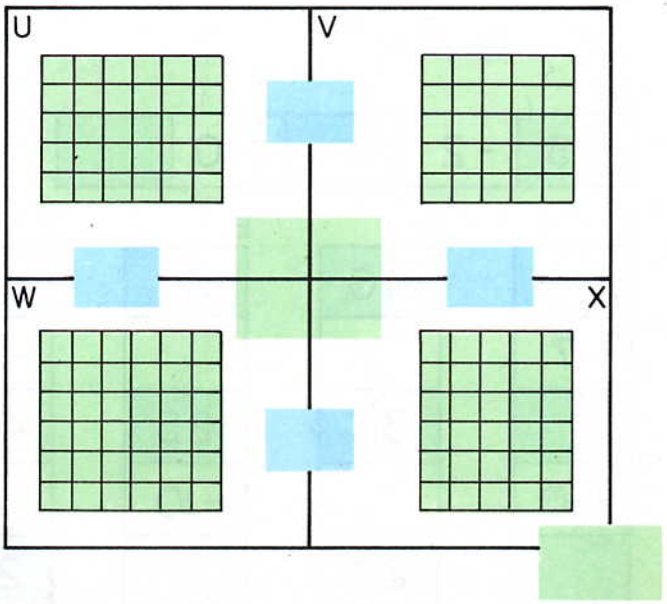

A
B
C
D
15
9
6
8
14
Total

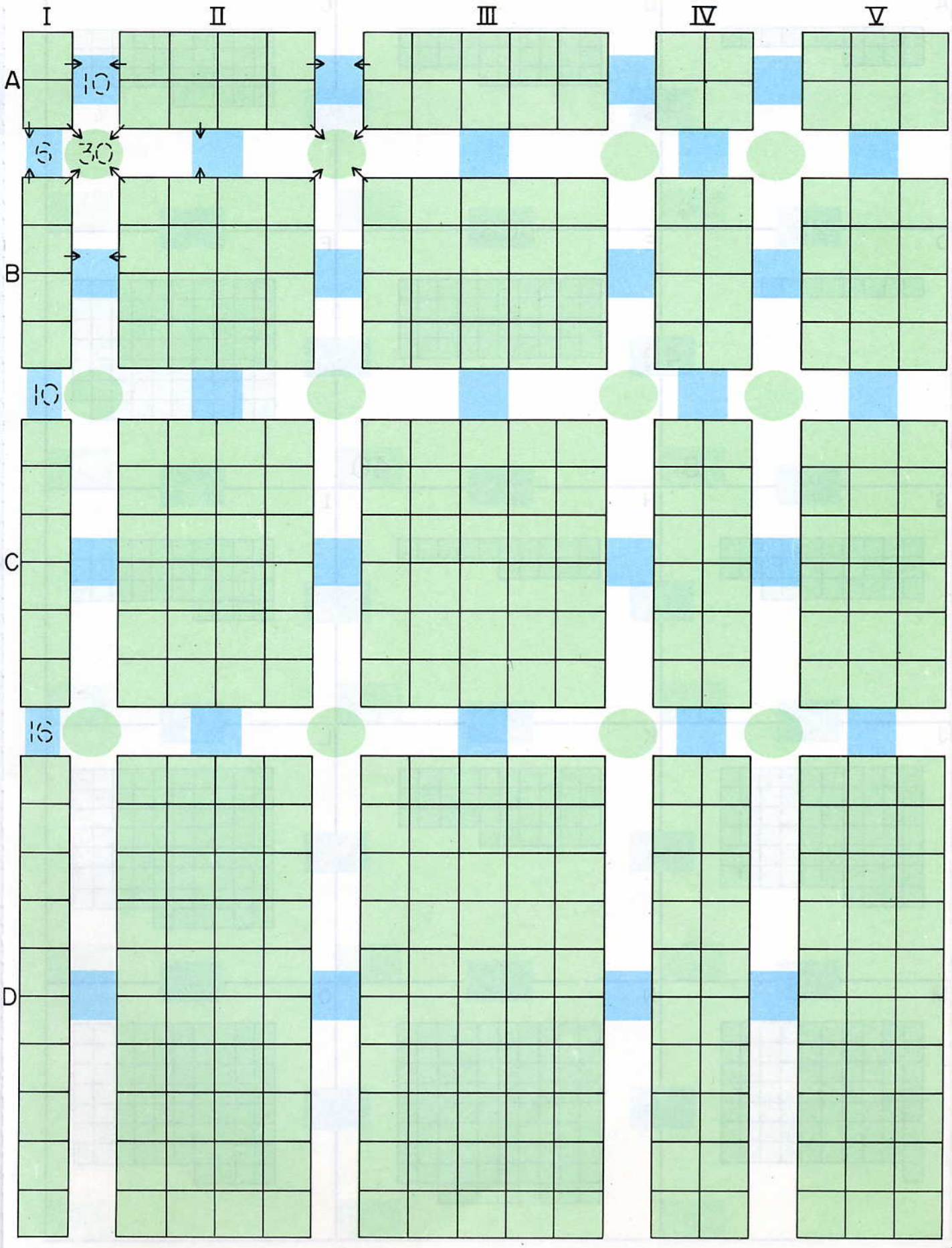

E
F
G
H

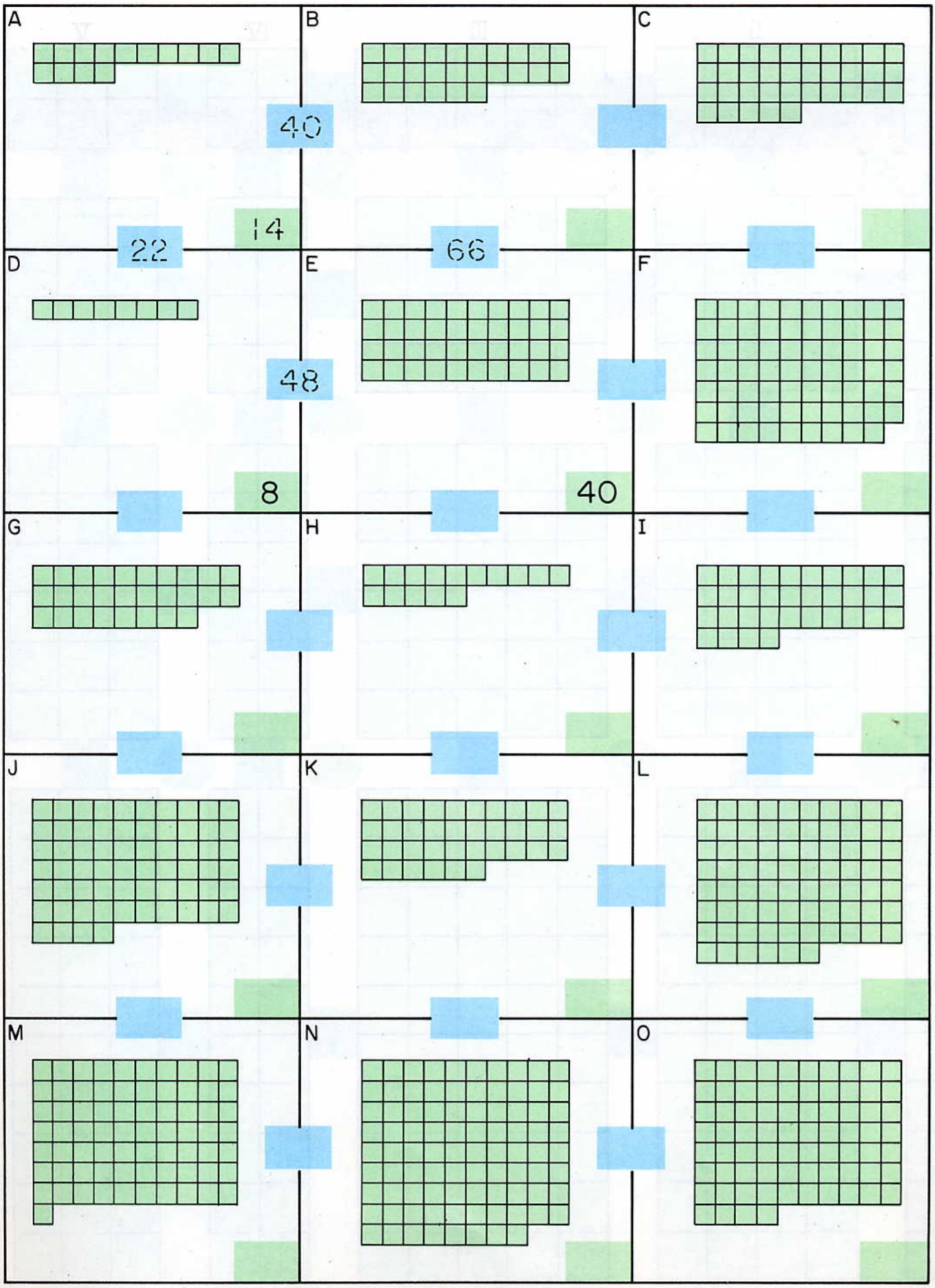

I
J
K
L

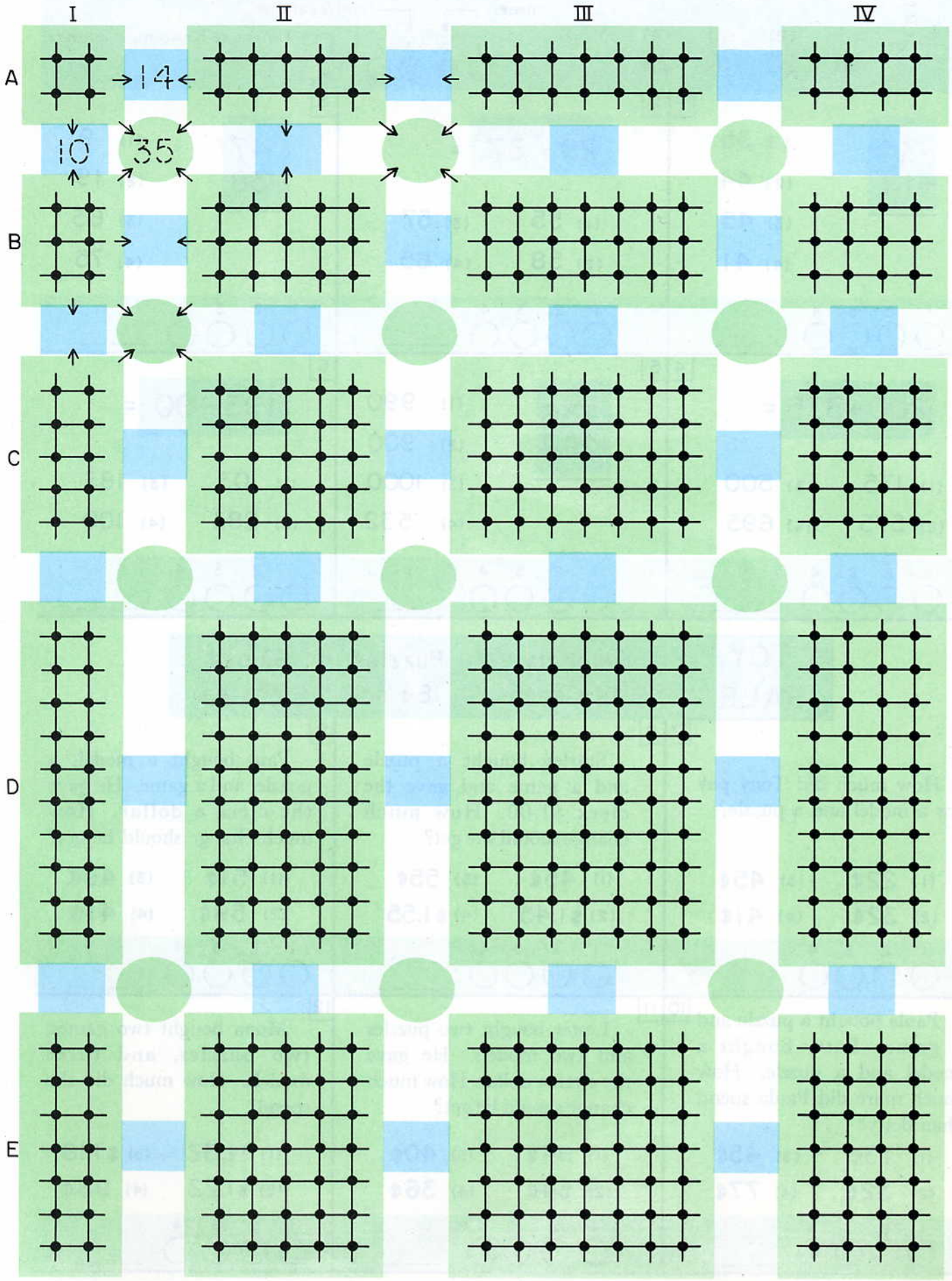

M
N
O
P


Q
R
S
T


U
V
W
X


I
II
III
IV
V
A
B
C
D
10
5
30
10
15


A
B
C
40
14
22
66
D
E
F
48
8
40
G
H
I
J
K
L
M
N
O


I
II
III
IV
A
B
C
D
E
14
10
35

Mark the correct answer.

Mark the furthest from the correct answer.

Difference between the answers you marked.

$$\begin{array}{r} 15 \\ +\ 5 \\ \hline \end{array}$$

(1) 16 (2) 20 (3) 10 (4) 25

1 2 3 4 ○ ● ⊗ ○ 10

1 | 2

$$\begin{array}{r} 34 \\ +11 \\ \hline \end{array}$$

(1) 35
(2) 44
(3) 45
(4) 41

1 2 3 4 _____

$28 + 37 =$

(1) 55 (3) 57
(2) 58 (4) 65

1 2 3 4 _____

3

$$\begin{array}{r} 47 \\ -38 \\ \hline \end{array}$$

(1) 9
(2) 19
(3) 85
(4) 75

1 2 3 4 _____

4 | 5

$200 + 375 =$

(1) 175 (3) 500
(2) 575 (4) 695

1 2 3 4 _____

$$\begin{array}{r} 736 \\ +264 \\ \hline \end{array}$$

(1) 990
(2) 900
(3) 1000
(4) 532

1 2 3 4 _____

6

$193 - 90 =$

(1) 103 (3) 183
(2) 283 (4) 100

1 2 3 4 _____

TOY SALE

Models	Puzzles	Games
14¢ each	18¢ ea.	27¢ ea.

7 | 8

How much did Tony pay for a model and a puzzle?

(1) 22¢ (3) 45¢
(2) 32¢ (4) 41¢

1 2 3 4 _____

Shirley bought a puzzle and a game and gave the clerk $1.00. How much change should she get?

(1) 45¢ (3) 55¢
(2) $1.45 (4) $1.55

1 2 3 4 _____

9

Paul bought a model, a puzzle, and a game. He gave the clerk a dollar. How much change should he get?

(1) 51¢ (3) 49¢
(2) 59¢ (4) 41¢

1 2 3 4 _____

10 | 11

Paula bought a puzzle and a game. Betty bought a model and a puzzle. How much more did Paula spend than Betty?

(1) 13¢ (3) 45¢
(2) 32¢ (4) 77¢

1 2 3 4 _____

Lester bought two puzzles and two models. He gave the clerk a dollar. How much change should he get?

(1) 64¢ (3) 40¢
(2) 54¢ (4) 36¢

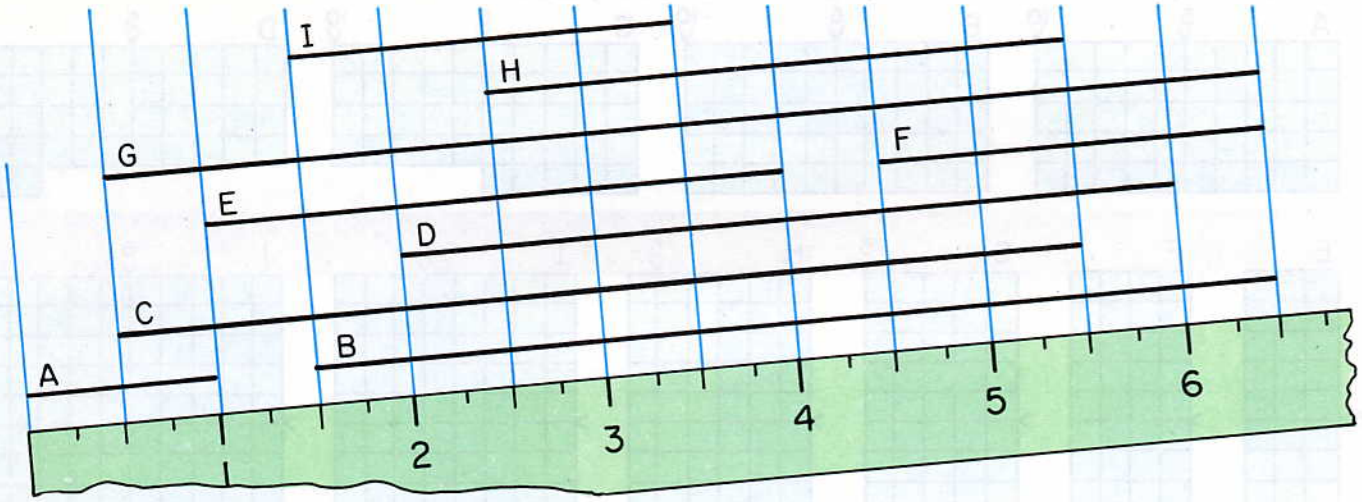
1 2 3 4 _____

12

Mona bought two games, two puzzles, and three models. How much did she spend?

(1) $1.32 (3) $1.18
(2) $1.22 (4) 98¢

1 2 3 4 _____



Lengths:

A: ____ inch C: ____ in. E: ____ in. G: ____ in. H: ____ in.

B: ____ inches D: ____ in. F: ____ in. I: ____ in.

SUMS of lengths:

A and E: ____ in. A, I, and F: ____ in.

G and C: ____ in. B, D, and G: ____ in.

B and H: ____ in. C, H, and A: ____ in.

D and F: ____ in. D, H, and B: ____ in.

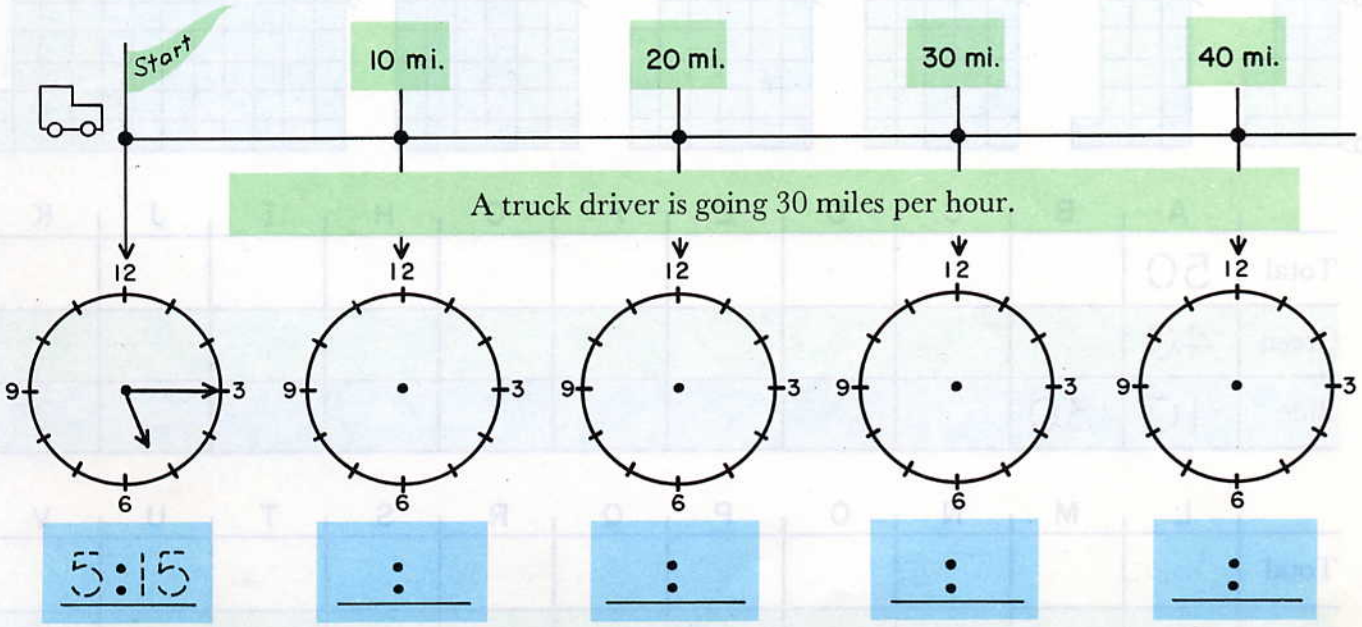
DIFFERENCES of lengths:

E and F: ____ in. H and I: ____ in.

G and D: ____ in. D and A: ____ in.

B and A: ____ in. G and F: ____ in.

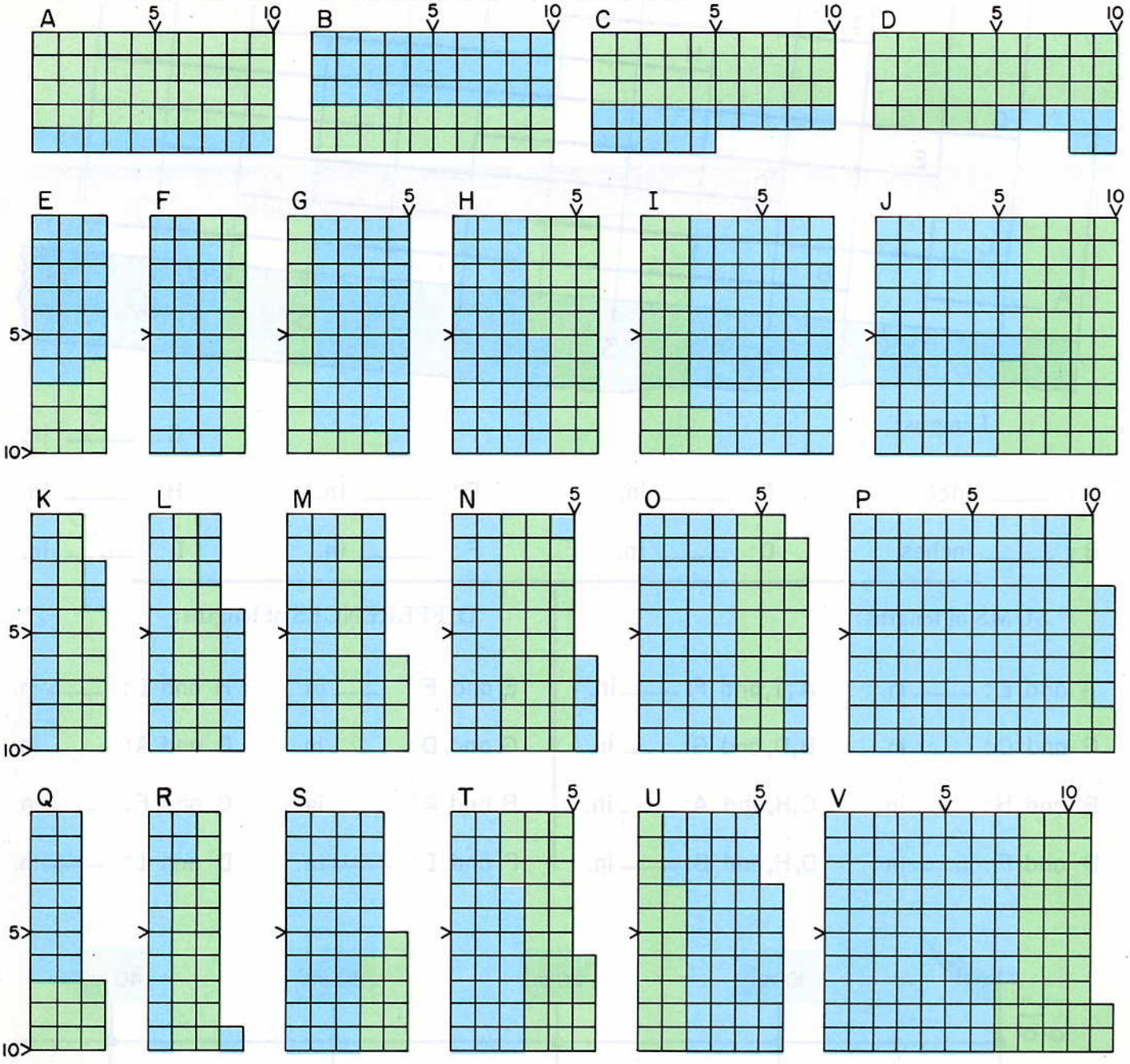
F and I: ____ in. D and I: ____ in.



He would travel:

____ miles in 2 hrs.; ____ miles in 1½ hrs.; ____ miles in 5 hrs.

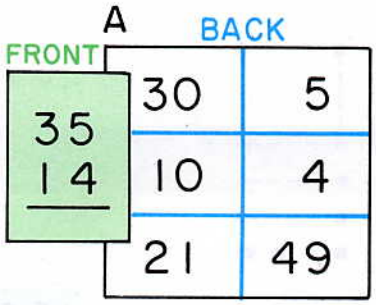
How many tiles in all? How many green? How many blue?



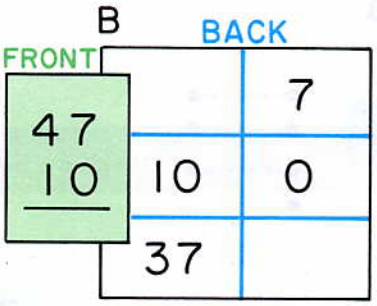
	A	B	C	D	E	F	G	H	I	J	K
Total	50										
Green	40										
Blue	10	30									

	L	M	N	O	P	Q	R	S	T	U	V
Total											
Green											
Blue											

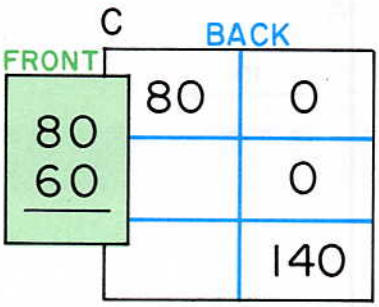
A



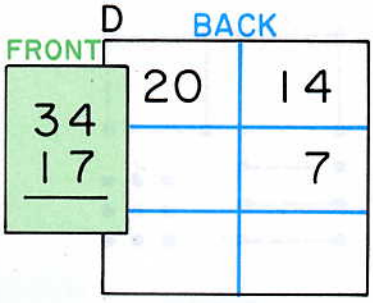
B



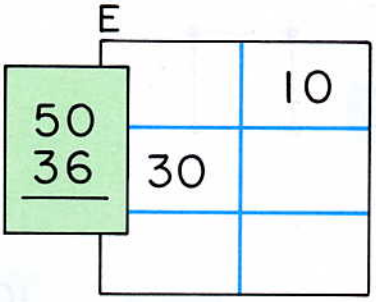
C



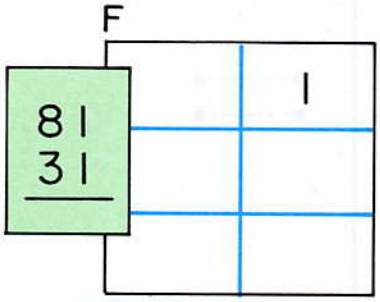
D



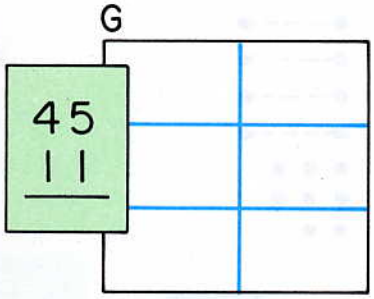
E



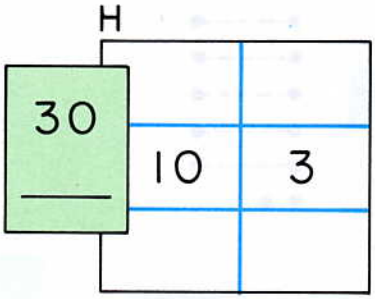
F



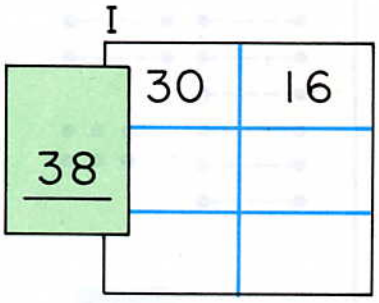
G



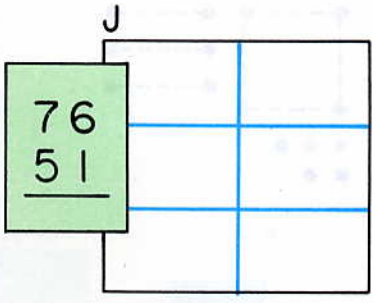
H



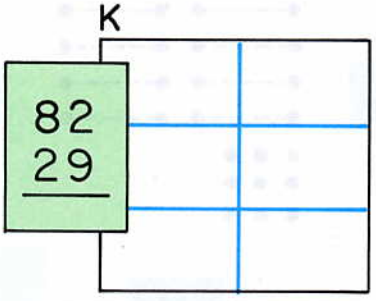
I



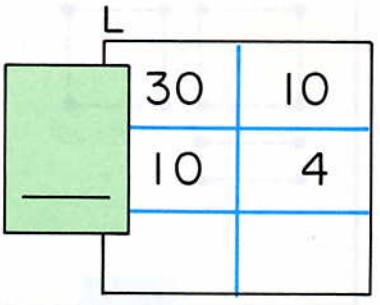
J



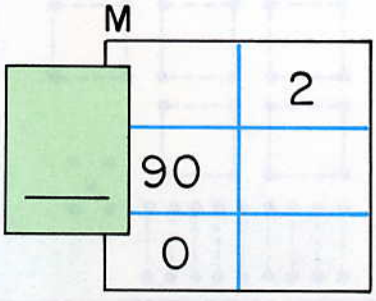
K



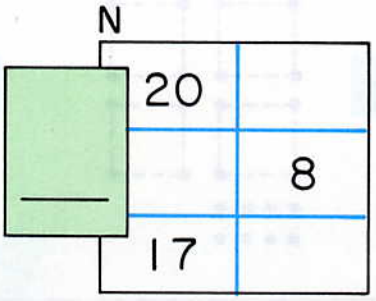
L



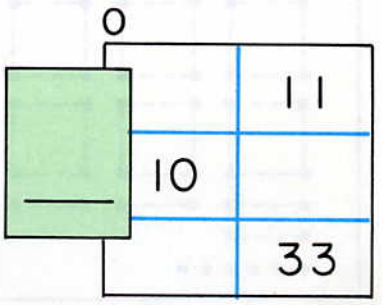
M



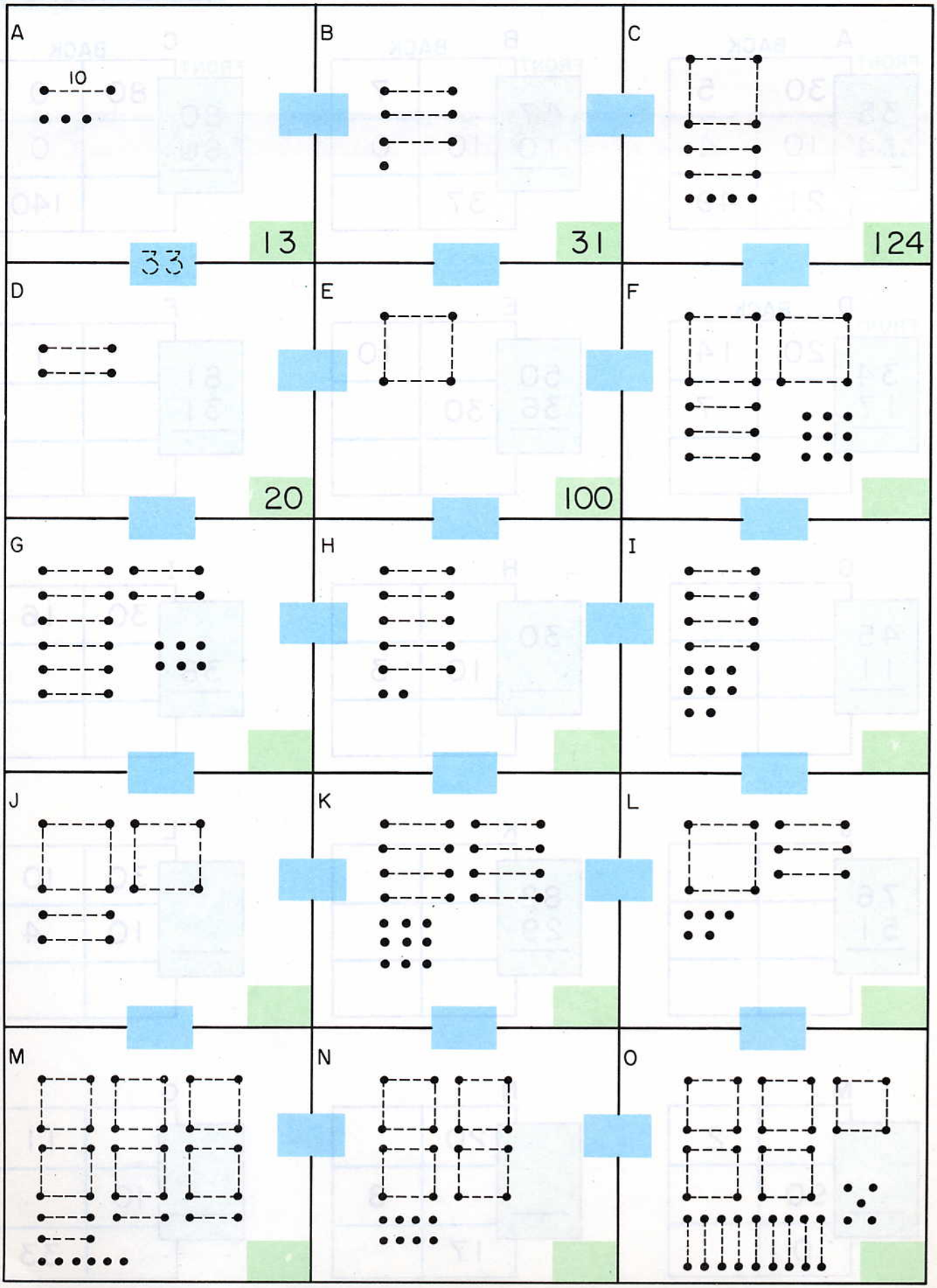
N

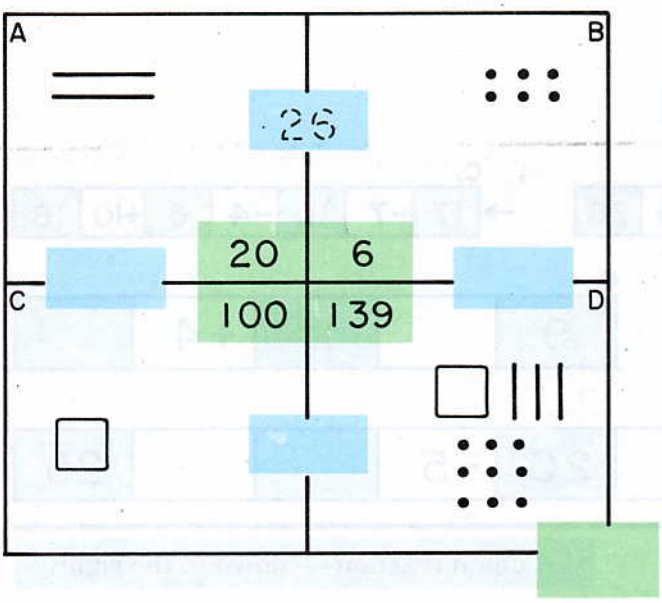


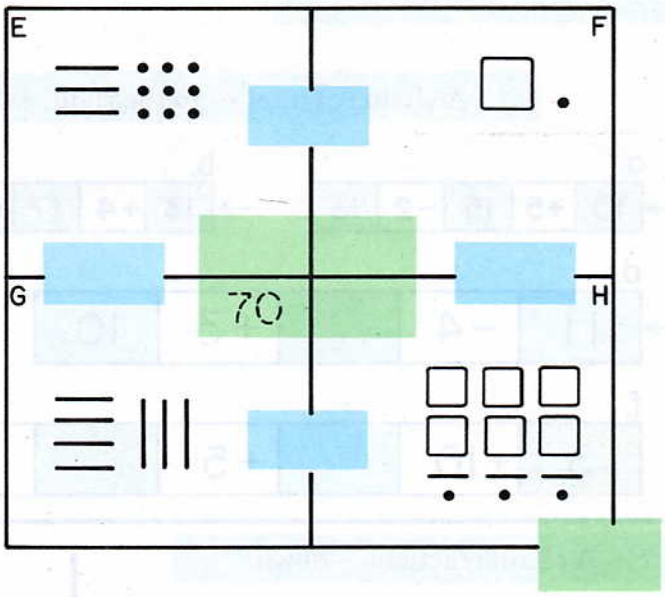
O

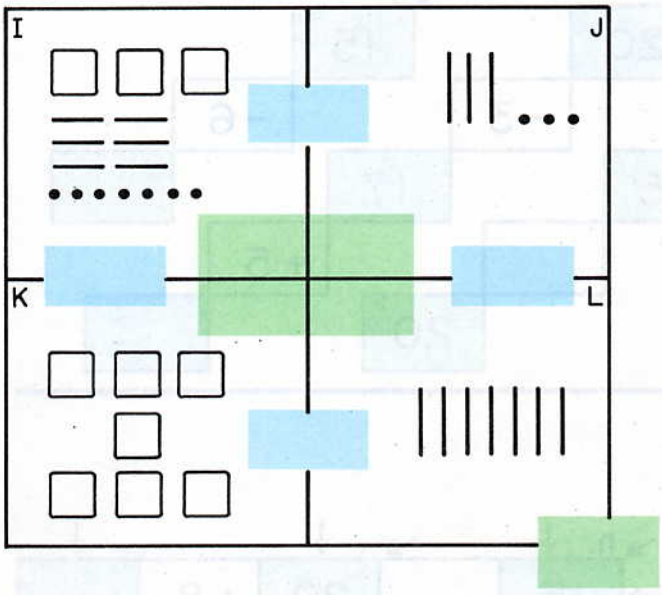


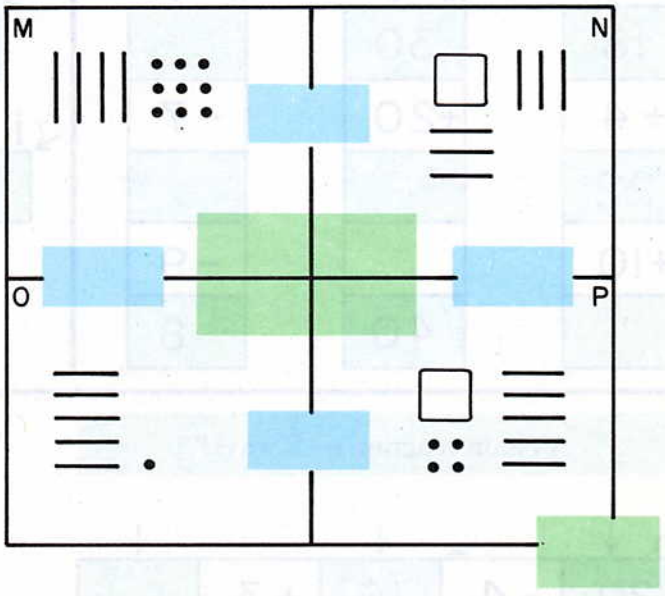
What Are My Rules? . . . Try to figure out the shorthand!

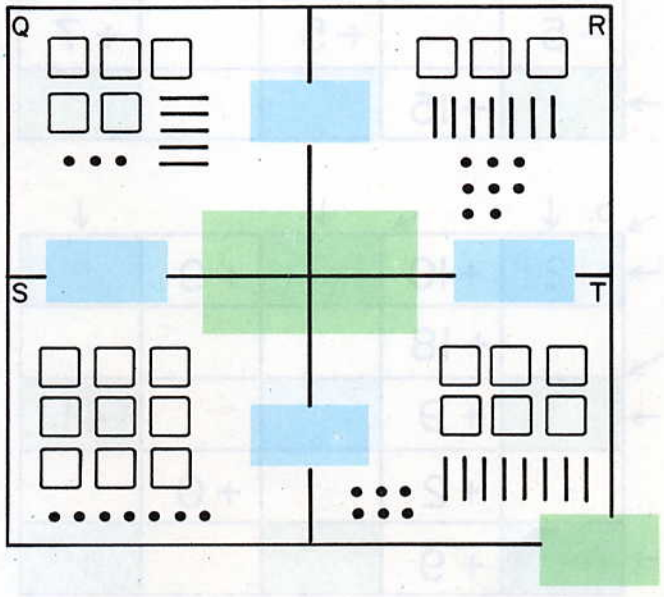


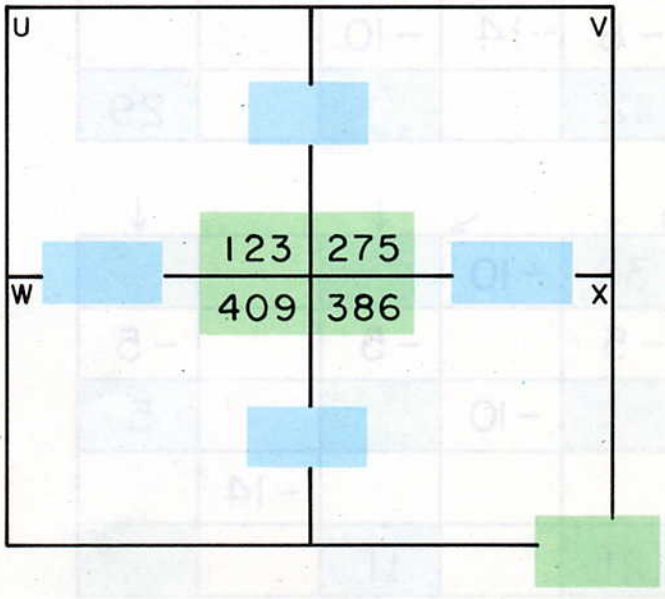

A
B
25
20
6
C
100
139
D


E
F
G
70
H


I
J
K
L


M
N
O
P


Q
R
S
T


U
V
123
275
W
409
386
X

What Are My Rules?

A chain reaction — to the right.

a.

→					
	10	+5	15	-2	13

b.

→					
	13	+4	17	+3	20

c.

→							
17	-7	10	-4	6	+10	16

d.

→					
	11	-4	7	+3	10

e.

9		11	+4	

f.

3	+10		+5			20	-5			25

A chain reaction — down.

g.

↓
18
+4
22
+10

h.

↓
30
+20
40

i.

↓
-7
-9
8

A chain reaction — down to the right.

k.

20				
	-3			
		17		
			+5	

l.

15				
	-6			

j.

25				
		20		

A chain reaction — 3 ways!

m.

↓		↓	↓	
20	-4	16	+3	
-8	-14	-10		
12				29

n.

↓		↓	↓	
15		20	+8	
-5		+5		+7
	+15			

o.

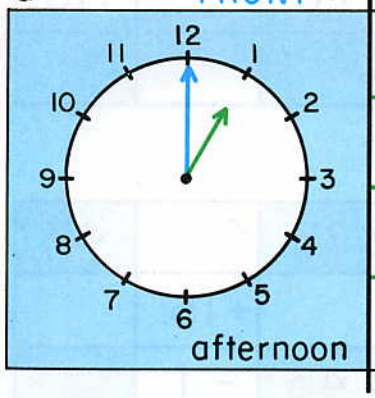
↓		↓		
30	-10			
-5		-5		-5
	-10			5
			-14	
21		11		

p.

↓		↓		
12	+10		+9	
	+18			
	+9			41
	+2		+0	
	+9			

a

FRONT



BACK

I 1:00 PM

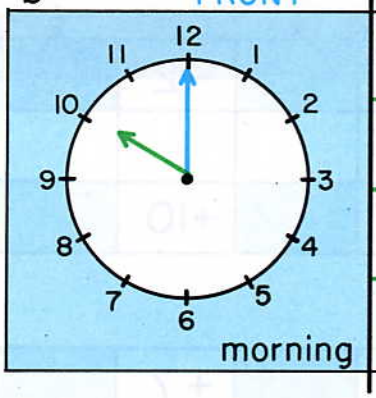
II 2:00 PM

III 12:30 PM

IV 3:15 PM

b

FRONT



BACK

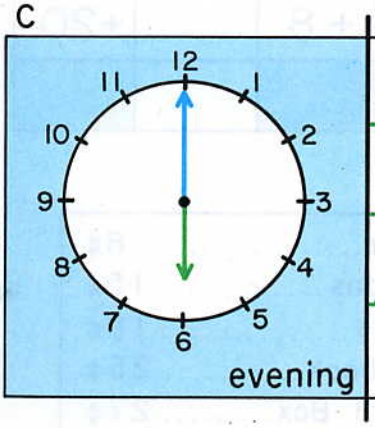
I 10:00 AM

II 11:00 AM

III

IV 12:15

c



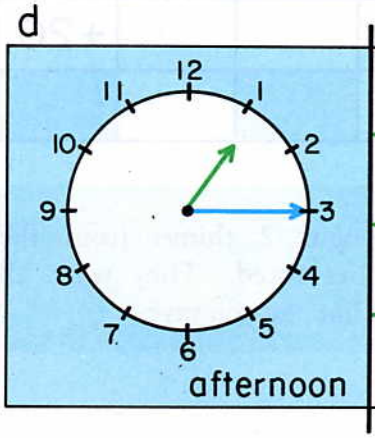
I

II

III 5:30 PM

IV

d



I

II 2:15

III

IV

e

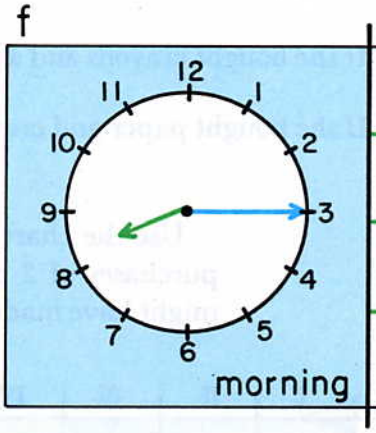
I

II

III 2:00

IV

f



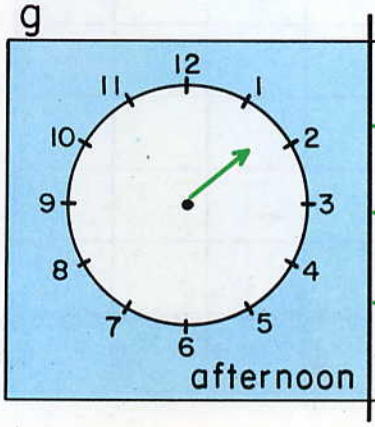
I

II

III

IV

g



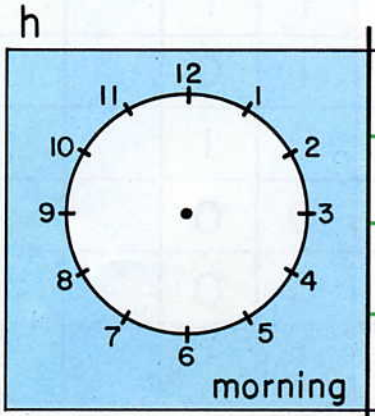
I 1:45

II

III

IV

h



I

II 6:45

III

IV

3-Way Chain Reactions

a.

8	+7	15	−2	13
+5				
	+10		+10	

b.

15	+10		+7	
+5	+25			+20
	+20			

c.

18			+8	
+5	+15	+6		+10

d.

25		27		47
			+15	
	+8	43	− 1	
		+8		+20
	+10			

Helen bought 2 things from the school supplies listed. They were all different. What can you say?

School Supplies

Paper	8¢
Crayons	15¢
Paints	18¢
Notebook	25¢
Pencil Box	27¢

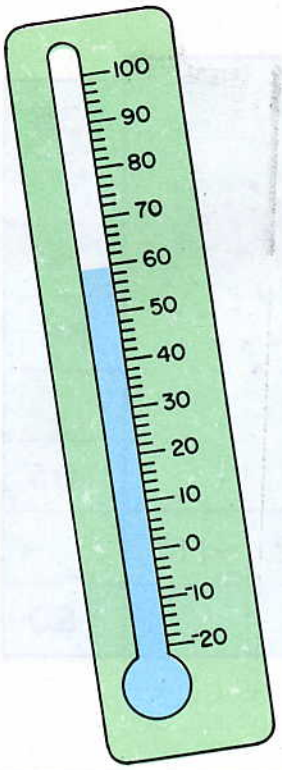
If she bought crayons and a notebook then she spent _____¢.

If she bought paper and crayons then she spent _____¢.

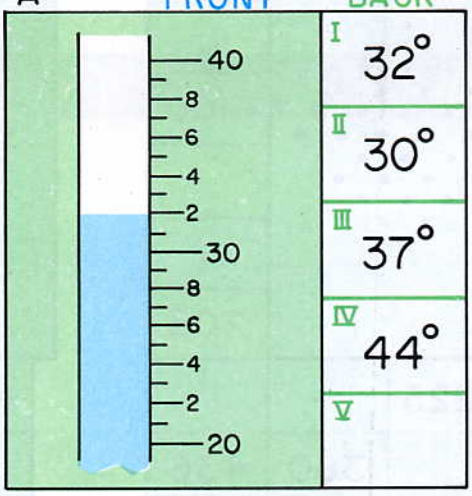
Use the chart below to explore the purchases of 2 different items Helen might have made.

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI
Paper — 8¢	1	1									
Crayons — 15¢	1	0									
Paints — 18¢	0	1									
Notebooks — 25¢	0	0									
Pencil Box — 27¢	0	0									
Total of purchases	23¢	¢	¢	¢	¢	¢	¢	¢	¢	¢	¢

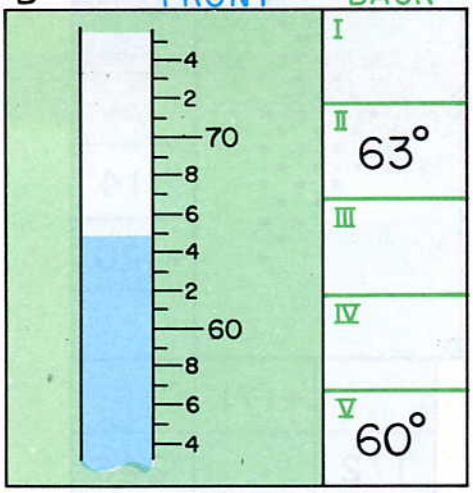
WAMR...Set K



A



B



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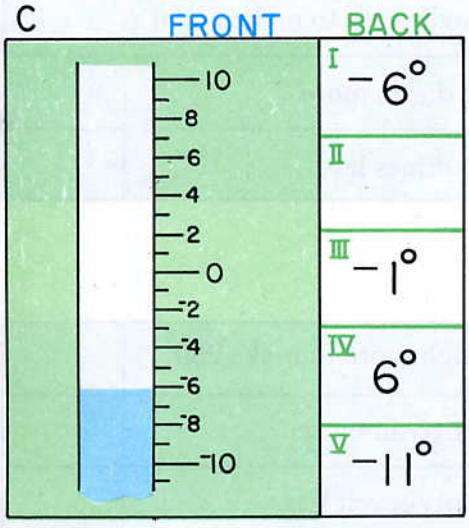

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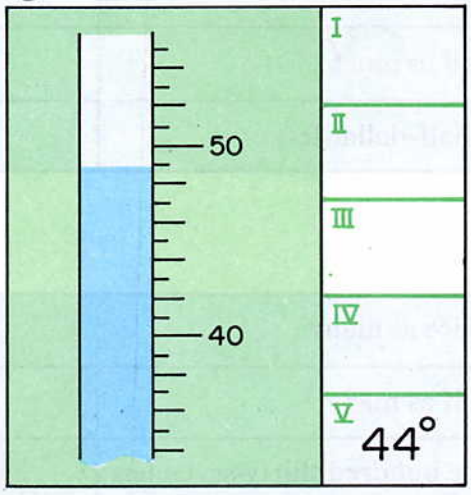

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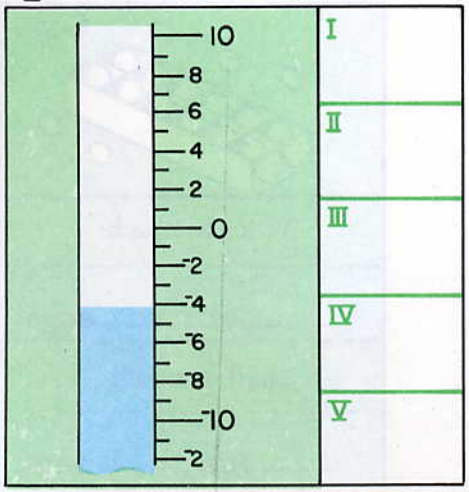

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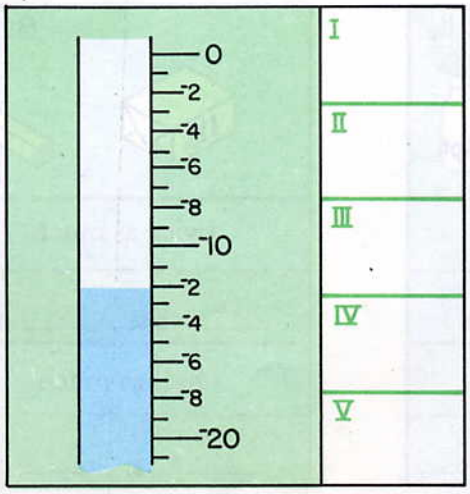


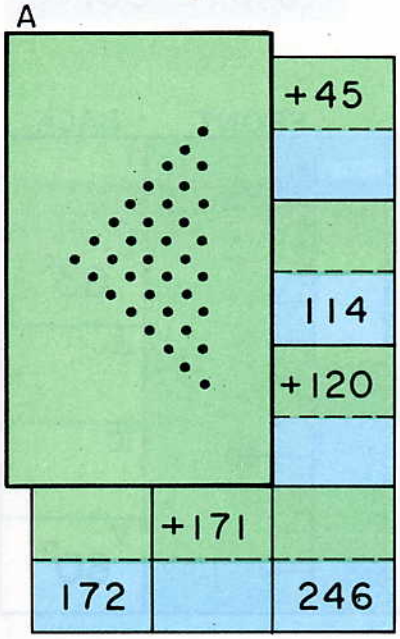
Extra –

Another game of What's My Rule?

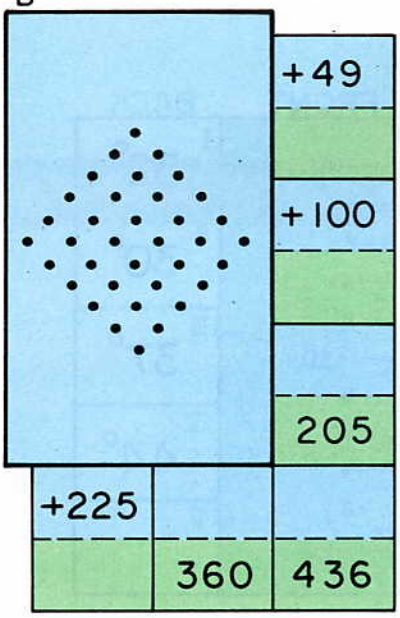
5	10
7	14
10	
	30
	24
0	
25	
	100
m	2m

What Are My Rules?

A



B



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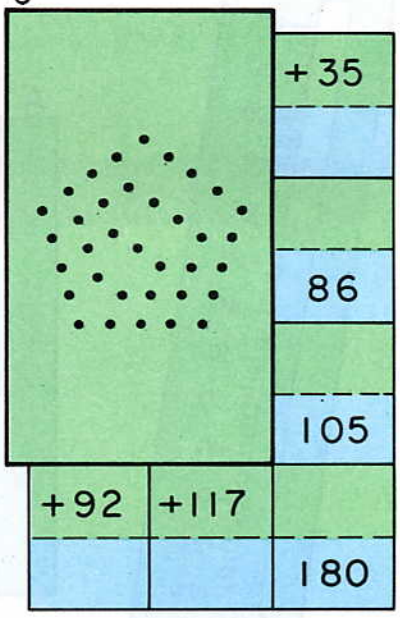
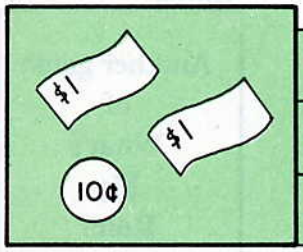
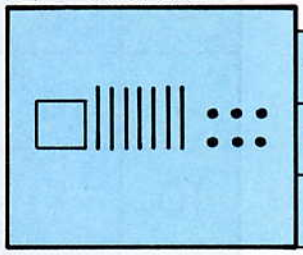


D



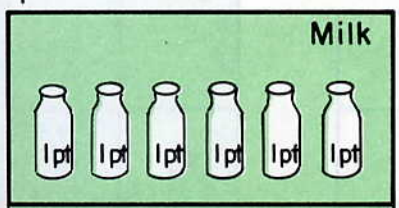
twice as much		enough more to make $5.00	
half as much		nine dimes more	
a half-dollar less		nine dimes less	

E Shorthand



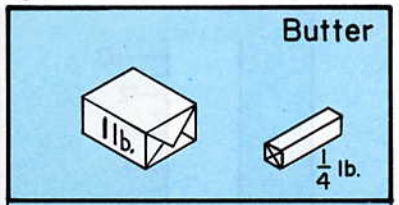
twice as many		enough more to make 250	
half as many		seventy-six more	
one hundred thirty-seven less		seventy-seven less	

F



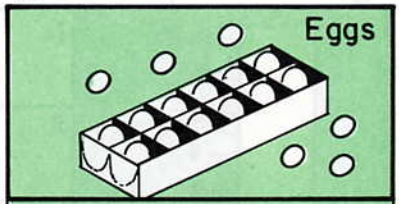
twice as much
____ gal., ____ qts.
half as much
____ qts., ____ pts.

G



twice as much
____ lbs., ____ oz.
half as much
____ lbs., ____ oz.

H



twice as much
____ doz., ____ eggs
half as much
____ doz., ____ eggs

Alice had five silver coins, all alike, and each coin was less than a dollar. She spent some of this money. What can we say?

First, we know that she had either

5 nickels worth _____ ¢, or

5 dimes worth _____ ¢, or

5 quarters worth $1.25 or _____ ¢, or

5 half-dollars worth $2.50 or _____ ¢.

If Alice had 5 nickels	
and spent ¢	then she has ____ ¢ left.
20	5
4	
10	
6	
15	
	16
	13
18	
7	
	25
	4
24	

If Alice had 5 dimes	
and spent ¢	then she has ____ ¢ left.
20	30
10	
5	
2	
7	
	38
	31
9	
	0
41	
18	
	15

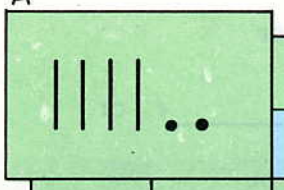
If Alice had 5 quarters	
and spent ¢	then she has ____ ¢ left.
20	
100	
50	
15	
	10
	108
30	
	90
40	
53	
60	
	27

If Alice had 5 half-dollars	
and spent ¢	then she has ____ ¢ left.
20	
200	
100	
50	
75	
	170
55	
150	
	199
242	
149	
125	

What Are My Rules?

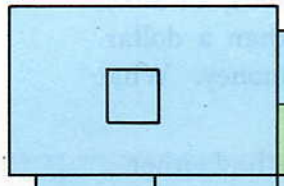
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	
17	30	22					36	15	24	0	x+y
10	25	13	14	26	50		31				x
7	5	9	6	8		7					y
3	20	4			30	13		1	0		x−y

A



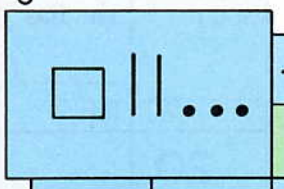
		−12	−20	+9
		30		
−9	+	−		
	77	11	60	25

B



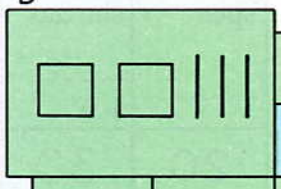
		−10	+28	−50
		90		
+100	+			
	254	30	75	87

C



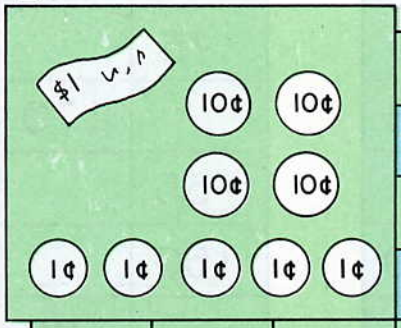
		−100	−20	−3
−50	−110	−33	−93	−25

D



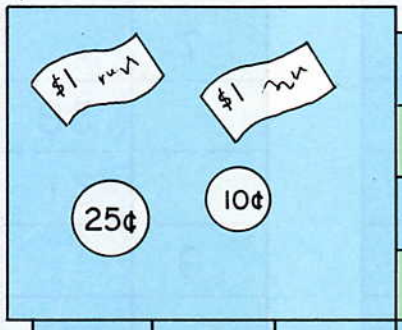
		−50	+75	−140
	+308	−2	−24	−36
300				

E



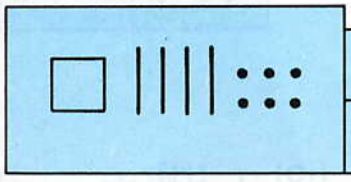
			+10¢	−45¢
			$1.55	
			−50¢	−16¢
+	+25¢	−$1.18		
$2.00			50¢	$2.50

F



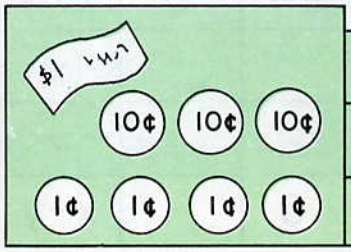
			−35¢	−$1.25
			+75¢	+90¢
−$2.05	−50¢	−$1.50	−57¢	
				$1.27

G



twice as many		three times as many	
half as many		fifty less	

H



twice as much		enough more to make $5.00	
half as much		nine dimes more	
a half-dollar less		nine dimes less	

Draw a ring around the number that would make the sentence true.

$3 \times 4 = 22 - \square$

12 32 **10** 13

A $2 \times \triangle = 9 + 7$

11 27 15 8

B $\square + 3 = 5 \times 3$

12 5 8 18

C $\triangle + 6 = 9 \times 3$

27 21 17 54

D $5 \times \bigcirc = 52 - 32$

2 4 6 7

E $4 \times 9 = \triangle \times 6$

4 6 8 13

F $(3 \times \square) + 4 = 5 \times 5$

7 3 25 9

G $\triangle \times 6 = 3 \times 8$

1 2 3 4

H $(2 \times 9) + 3 = (\square \times 3) + 3$

4 5 6 7

I $(4 \times \triangle) - 9 = (2 \times 8) - 9$

4 5 6 11

J $20 + 25 = \bigcirc \times 5$

5 7 9 11

K $7 \times 9 = \triangle \times 7$

16 7 10 9

L $\square \times 15 = (5 \times 9) - 0$

0 3 6 9

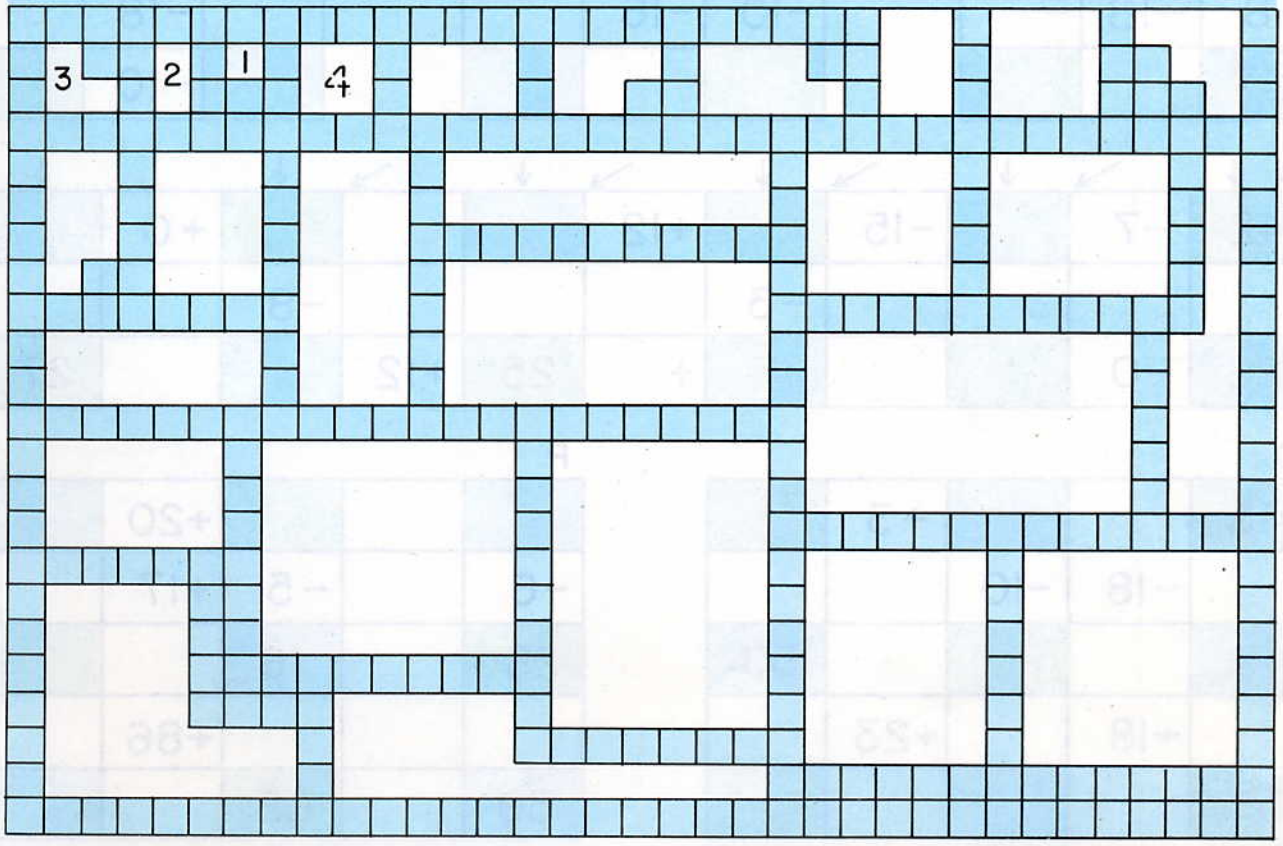
M $(\triangle \times 4) + 73 = (2 \times 10) + 73$

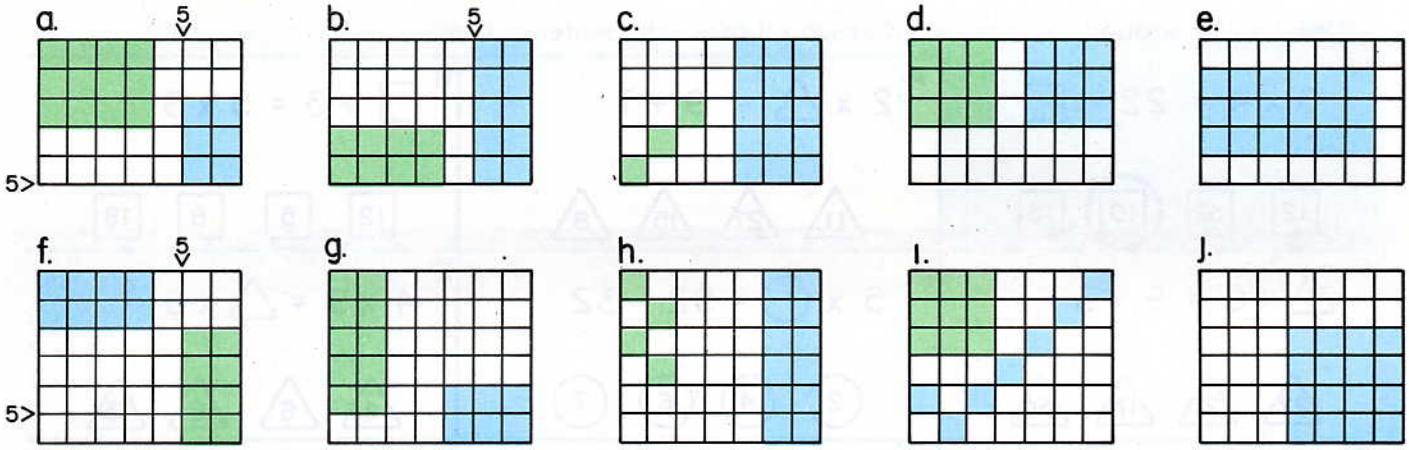
73 77 5 12

N $(3 \times 8) + 16 = 4 \times \bigcirc$

4 5 7 10

Indicate the number of missing tiles.





	a	b	c	d	e	f	g	h	i	j
Total										
Green	12									
Blue	6									
Blue *or* green	18									
White	17									

3-way chain reactions

K

35	−3	32
−8	−18	
27		

L

42		38
−10	−16	

M

35	−0	
	−18	
	−10	

N

42	−7		−15		+12				+0	
				−3				−8		
26	−0				÷	25	+12			27

O

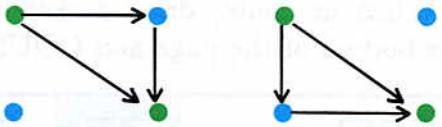
45			+3	
	−18	−10		
45				50
	+18		+23	
53				

P

			+20	
−6		−5	+17	
26		16		
			+86	
30		62		

More 3-way chain reactions.

Look for patterns.



A.

4	+1	5
+3	+6	+5
7	+3	10

B.

12	−4	8
−5	−7	−3
	−2	5

C.

7	+2	
−5	−4	−6
	+1	3

D.

12	−5	7
+2	+5	
14		17

E.

15	−2	
17	−12	

F.

20	−4	
−6		
		9

G.

13	+10		−10	
−4	+7	−3	−6	+4
	+11		−3	

H.

20		17		
				+18
13		7	+12	

I.

12		22		42
20		30		33
25		10		3

J.

36	−20			21
	−18	+2		
	−10		+3	
−9			−7	
		9		

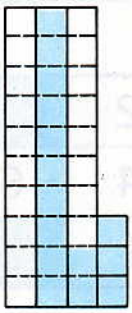
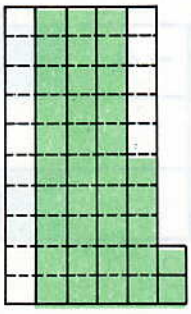
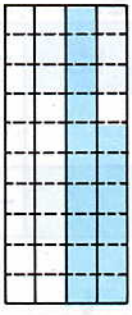
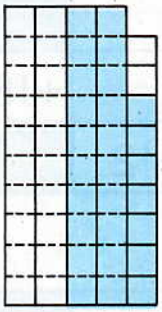
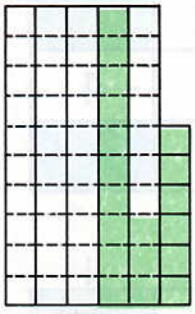
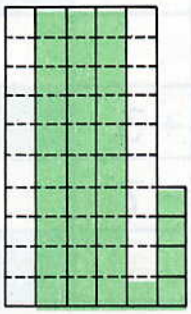
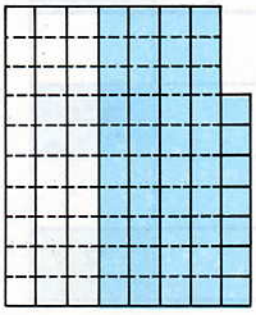
K.

	+8			47
		+10		
33		42		
				−30
	−13	22		21

L.

3	+9			
		+9	+8	−4
	+15			
			+19	
	+8		+9	

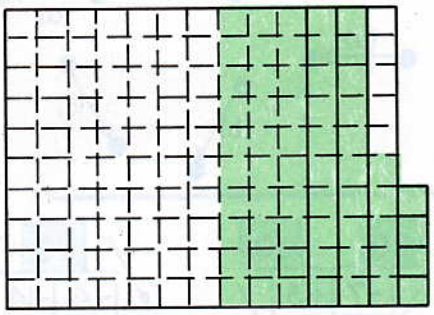
When in doubt, draw a sketch at the bottom of the page and COUNT.

A 	33 −15	33 −10	33 − 3
	33 −25	33 −31	33 −19
B	28 −14	28 −18	28 − 9
	28 −20	−28	−19
C 	−	−22	− 9
	−33	−16	−25
D 	−	−25	− 8
	−29	−14	−37
E 	−	−29	−10
	−22	−28	−14
F 	−	−48	−13
	−27	−30	−38
G 	−	−42	− 8
	−16	−29	−47
H 	−	−30	−19
	−58	−16	−28

When in doubt, draw a sketch below and COUNT.

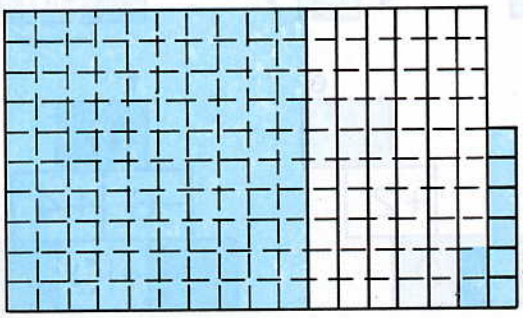
When in doubt, draw a sketch at the bottom of the page and COUNT.

I



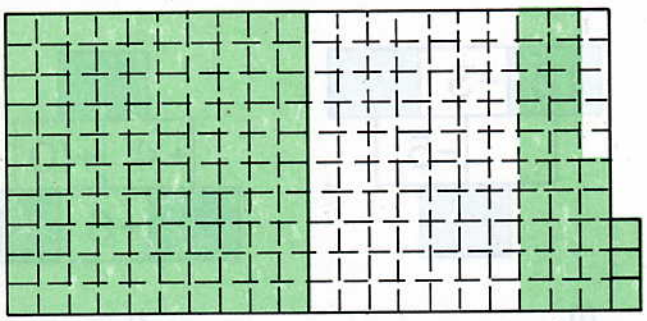
134 - 59	134 - 70	- 17	-104	- 94
- 68	- 86	-109	- 35	- 57

J



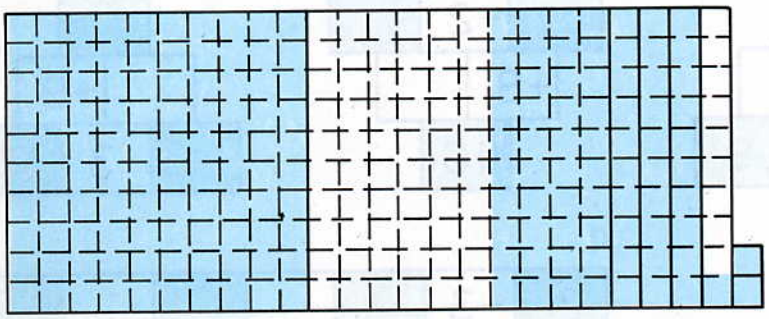
-	- 43	- 75	-129	- 96
- 67	- 18	- 81	- 87	-148

K



-	-200	-160	- 43
- 85	-109	- 17	- 56

L



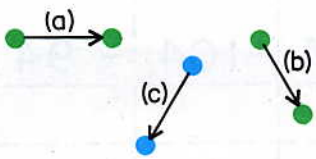
-	- 90	-115
- 84	-146	-177

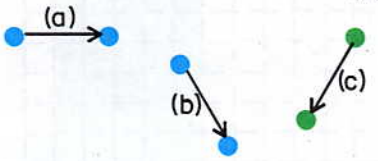
Here are some 3-way chain reactions with these ways of moving:

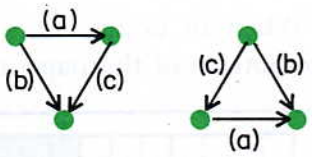
(a) left to right

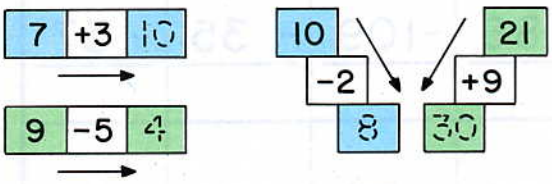
(b) down and to the right

(c) down and to the left









a. 11 -3 8

b. 9 +4 ☐

c. 10 -6 ☐

d. 7 +5 12

e. ☐ +2 10

f. 11 -6 +4 ☐ ÷10 ☐

g. 7 -3 ☐ -6 -3 ☐

h. 9 ÷1 ☐ 10 -8 ☐

i. 12 -3 ☐ -5 ☐

j. ☐ +4 +10 ☐ +6 14

k. 13 ☐ 4 ☐ ☐ 6

l. 18 ☐ ☐ 12 ☐ 9

m. ☐ -2 ☐ +8 ☐ 16

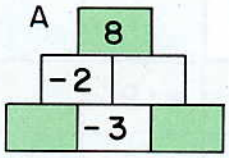
n. ☐ +9 ☐ -3 16

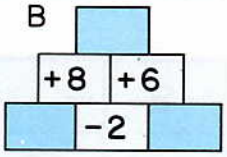
o. 20 ☐ ☐ -7 -10 ☐ ☐ +15 18 ☐ ☐ +13 ☐ ☐

p. 17 -7 ☐ ☐ -2 ☐ +18 ☐ ☐ -20 -19 ☐ ☐ ☐

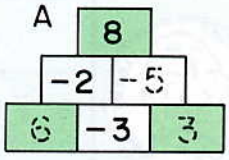
q. 21 -3 ☐ ☐ ☐ ☐ ☐ -13 ☐ -14 ☐ ☐ ☐ ☐ ☐ ☐ ☐ +10 +17 ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ +14 ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

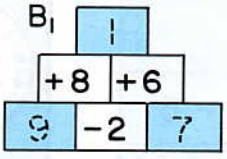
Look at the chain reactions in these two examples:

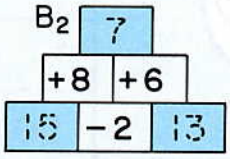


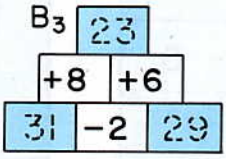


There is only one way to complete example A. But there are many ways to complete example B.



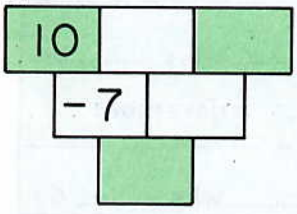




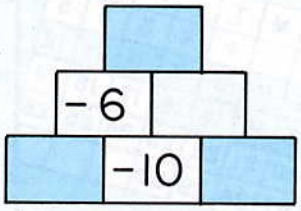


The chain reaction examples on this page are not like example A. They are like example B. Complete them in any way you like.

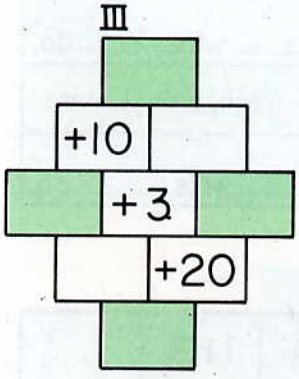
I



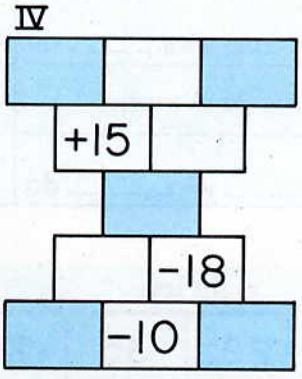
II



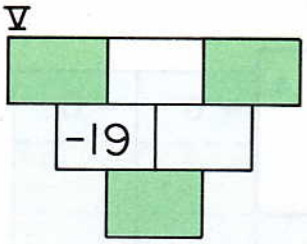
III



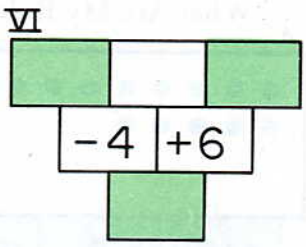
IV



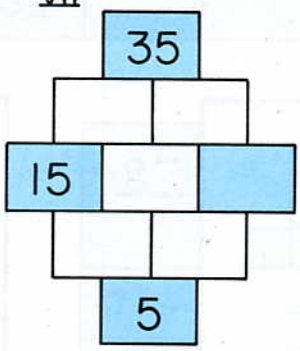
V



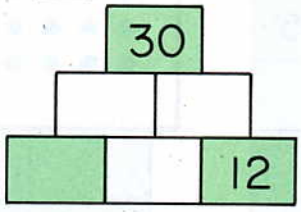
VI



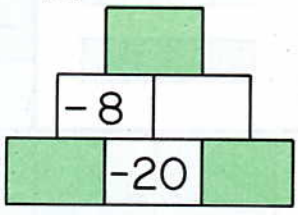
VII



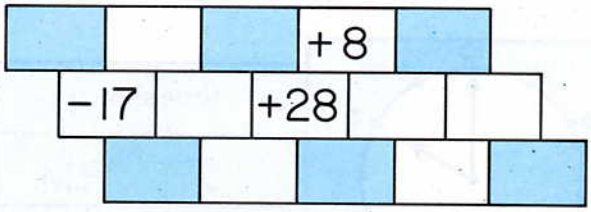
VIII



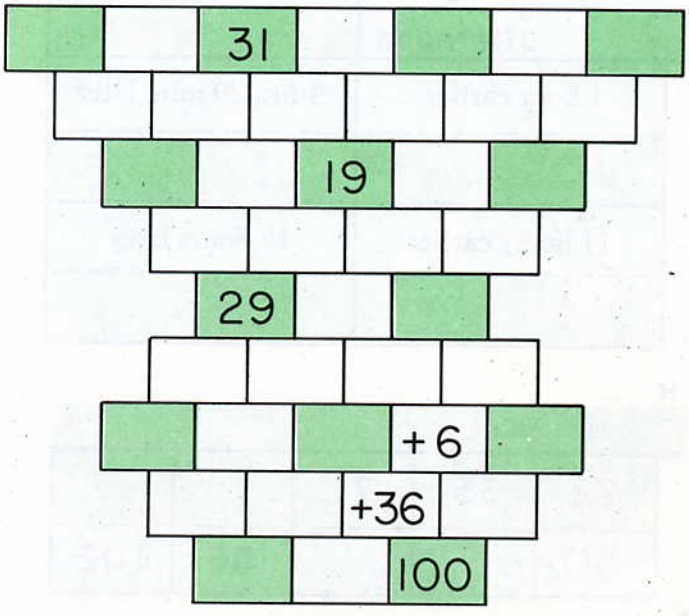
IX



X

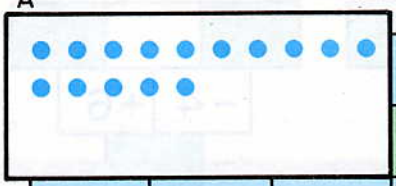


XI



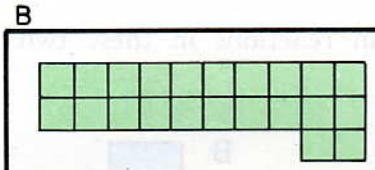
What Are My Rules?

A



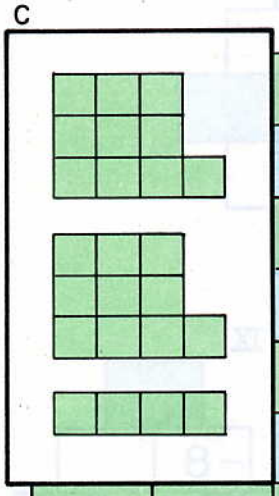
			+ 6	− 6
+ 15	+ 9	− 9	+	−−
			25	8

B



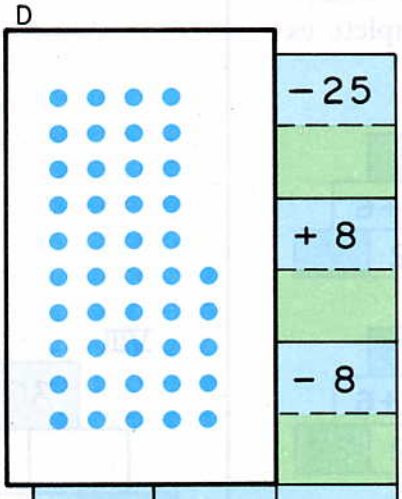
			− 3	+ 8
− 9	+		+ 19	
	40	6		51

C



			− 6
			+ 17
			− 15
50	31	24	

D

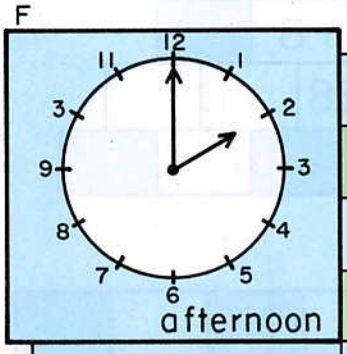


			− 25
			+ 8
			− 8
50	75	16	

E

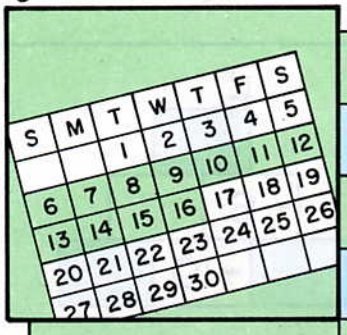
			+ 10¢
			¢
			− 7¢
			¢
			¢
			50¢
¢	¢	¢	
42¢	9¢	$1.00	

F



time shown	
:	P.M.
three hours later	
:	
1 hour earlier	1 hr., 20 min. later
:	:
11 hours earlier	12 hours later
:	:

G



S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

weeks and days shaded green	
____ wk., ____ da.	
5 days more	
____ wks., ____ da.	
5 days less	twice as many
____ wks., ____ da.	____ wks., ____ da.
½ as many	1 week, 6 days more
____ wks., ____ da.	____ wks., ____ da.

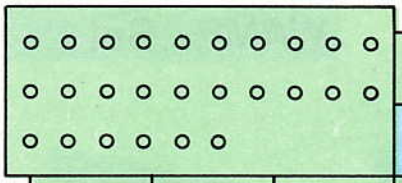
H

eight more				
22	35	71		
30			56	102

I

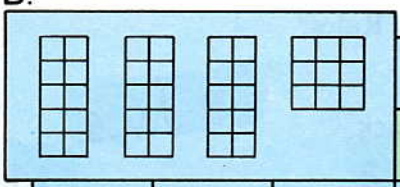
eight less				
29	35	20	110	
21				64

A.



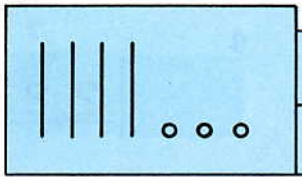
		+19		
				91
−9			−17	+975
	101	7		

B.



			+70	−21
+68		+166	−15	
	206			133

C.

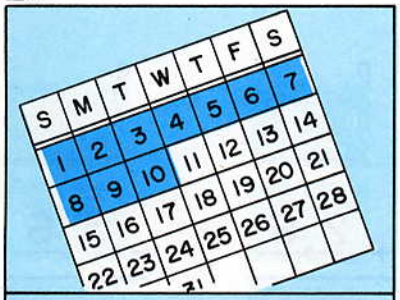


plus thirty-four			86
	100	plus one hundred fourteen	

D.

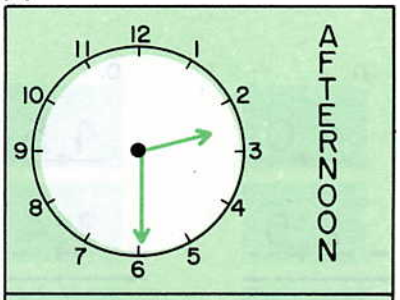
plus seventy-six cents			7 ¢
minus sixteen cents		plus two dollars and three cents	
	$ 9.25	minus twenty-five cents	

E.



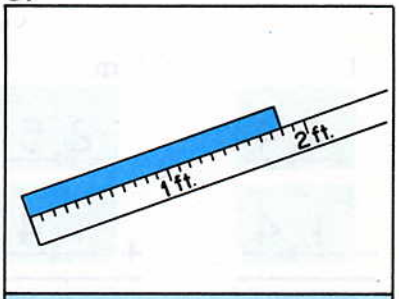
plus 1 week, 4 days
3 weeks, 0 days
plus ___ weeks, ___ days
2 weeks, 1 day
plus 5 weeks, 6 days
___ weeks, ___ days
plus ___ weeks, ___ days
4 weeks, 2 days

F.



2 hours and 15 minutes later
:
1 hour and 35 minutes earlier
:
11:00 AM
6:05 PM

G.



plus 1 foot, 2 inches
___ feet, ___ inches
minus 9 inches
___ foot, ___ inch
plus 14 inches
___ feet, ___ inches
plus 22 inches
___ feet, ___ inches

What Are My Rules?

WAMR... Set L

FRONT	BACK
9	1,2

CLUE:

4	0,4	7	1,0	8	1,1	11	1,4		
0	0,0	14	2,0	21	3,0				

a. 6 | 0,6

b. 13 | ,

c. 15 | ,

d. 12 | 1,5

e. 10 | ,

f. 17 | ,

g. | 2,2

Please watch the signs!

h.

	14	2,0
+	7	1,0
	21	,

i.

		4,0
−	14	2,0
	14	,

j.

		2,5
+	9	,
		,

k.

		1,6
−		,
	4	,

l.

	4,4
−	1,4
	,

m.

	2,5
+	1,4
	,

n.

	4,0
−	2,5
	,

o.

	4,5
−	3,4
	,

p.

	,
+	2,6
	3,4

q.

	,
−	3,6
	0,3

r.

	4,0
	0,3
+	0,3
	,

s.

	1,3
	2,3
+	0,1
	,

t.

	2,4
	0,4
+	1,3
	,

u.

	1,3
	1,4
+	1,1
	,

v.

	2,3
	0,5
+	0,6
	,

w.

	1,6
	1,4
+	0,5
	,

A nickel (n.) is worth five pennies (p.).

What Are My Rules?

WAMR... Set M

FRONT n.	FRONT p.	BACK n.	BACK p.
0	1	0	4

FRONT n.	FRONT p.	BACK n.	BACK p.
0	2	1	0

a.

n.	p.	n.	p.
0	4	1	2

b.

n.	p.	n.	p.
0	0		

c.

n.	p.	n.	p.
1	0		

d.

n.	p.	n.	p.
0	3		

e.

n.	p.	n.	p.
1	2		

f.

n.	p.	n.	p.
2	2		

g.

n.	p.	n.	p.
		2	4

h.

n.	p.	n.	p.
		2	1

WAMR... Set N

FRONT n.	FRONT p.	BACK n.	BACK p.
0	2	0	4

FRONT n.	FRONT p.	BACK n.	BACK p.
0	3	1	1

i

n.	p.	n.	p.
0	4	1	3

j.

n.	p.	n.	p.
1	0	2	0

k.

n.	p.	n.	p.
0	1		

l.

n.	p.	n.	p.
2	2		

m.

n.	p.	n.	p.
1	3		

n.

n.	p.	n.	p.
		2	2

o.

n.	p.	n.	p.
1	4		

p.

n.	p.	n.	p.
		5	1

There are sixty minutes (min.) in an hour (hr.).

Watch the signs!

Only numbers less than 60 in the white boxes.

A.

hr.	min.
0	30
+ 0	30
1	00

B.

hr.	min.
1	45
+ 0	15
	00

C.

hr.	min.
1	00
− 0	15

D.

hr.	min.
7	00
− 2	00

E.

hr.	min.
0	50
+ 0	15
	05

F.

hr.	min.
2	45
+ 1	15

G.

hr.	min.
3	30
− 0	29

H.

1	47	
+ 8	13	

I.

17	27	
− 7	27	

J.

12	00	
− 0	45	

K.

hr.	min.
11	45
+ 12	15

L.

24	00	
− 20	59	

M.

15	50	
− 6	40	

N.

6	39	
+ 17	21	

O.

10	05	
− 0	06	

There are seven days (da.) in a week (wk.).

Use only numbers less than 7 in the white boxes.

a.

wk.	da.
1	2
+ 2	4
3	6

b.

wk.	da.
1	3
+ 0	4
2	0

c.

wk.	da.
0	2
+ 0	5

d.

0	4
+ 0	4

e.

0	6
+ 0	5

f.

wk.	da.
1	6
+ 2	0

g.

1	3
+ 1	5

h.

2	3
+	
3	0

i.

+ 1	3
3	5

j.

2	4
+	
4	1

There are twelve inches (in.) in a foot (ft.).

Use only numbers less than 12 in the white boxes.

k.

ft.	in.
0	4
+ 0	7
0	11

l.

ft.	in.
0	6
+ 0	6
1	

m.

ft.	in.
0	10
+ 0	5

n.

1	8
+ 1	4

o.

1	4
+	
3	2

p.

ft.	in.	+ ft.	in.	ft.	in.
1	0	2	7	3	7

q.

1	2	0	11		

r.

		+			
1	8			3	11

s.

		0	9	2	0

A dime (d.) is worth ten pennies (p.).

Use only numbers less than 10 in the white boxes.

t.

d.	p.
2	3
+ 0	5
2	

u.

d.	p.
0	5
+ 0	5

v.

d.	p.
1	6
+ 0	7

w.

2	4
+ 6	5

x.

1	2
+	
2	0

y.

d.	p.	+ d.	p.	d.	p.
2	9	2	2		

z.

		+			
1	7			3	1

A quarter is worth five nickels and a nickel is worth five pennies.

Only numbers less than 5 in the white boxes.

a.

25¢	5¢	1¢
1	0	0
+ 0	2	1

b.

25¢	5¢	1¢
1	2	3
+ 0	2	1

c.

25¢	5¢	1¢
1	1	1
+ 1		
	2	4

d.

25¢	5¢	1¢
1	2	4
+ 1	3	2

e.

25¢	5¢	1¢
1	1	1
0	2	4
+ 0	3	3

f.

25¢	5¢	1¢
	0	2
1		0
+ 1	1	
3	3	4

g.

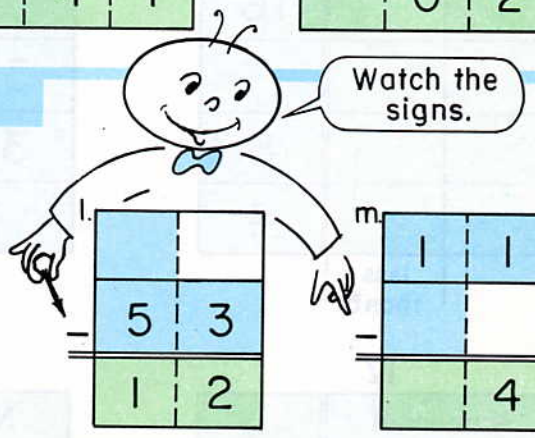
25¢	5¢	1¢
0	2	2
0	2	
+ 0		2
	4	1

h.

25¢	5¢	1¢
0	0	4
0	1	
+ 0		4
	0	2

There are seven days in a week.

Only numbers less than 7 in the white boxes.



i.

w.	d.
2	1
+ 1	3

j.

4	4
+ 2	3

k.

4	5
− 2	3

l.

− 5	3
1	2

m.

1	1
−	
	4

n.

5	5
+	
11	4

o.

5	0
− 4	6

p.

6	
+	3
14	2

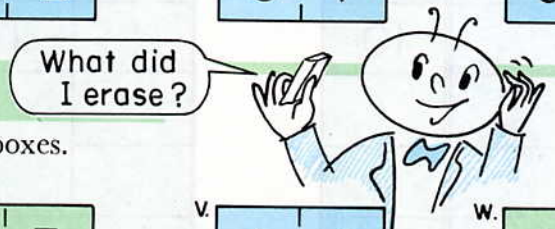
q.

	0
− 4	
5	1

r.

10	
− 0	
9	1

A dime is worth ten pennies.



Only numbers less than 10 in the white boxes.

s.

d.	p.
1	5
1	4
+ 1	6

t.

0	
1	7
+ 1	4
4	

u.

2	7
	6
+ 2	
10	0

v.

1	4
2	
+ 2	2
	0

w.

1	
1	
+ 1	
5	5

What Are My Rules? Look for patterns when you complete the tables.

I

Number of nickels	Number of pennies	cents
8	0	40
7	1	36
6	2	32
		16
		8
		4

less than 5

II

Number of feet	Number of inches	inches
		5
0	10	
1	3	
		20
		25
3	4	
3		45
		50

< 12

III

Number of dimes	Number of pennies	cents
4	5	45
	9	39
		36
		33
		30
2		24
2	1	

< 10

IV

Number of weeks	Number of days	days
0	6	
		8
		10
1	5	
2		16
		22

< 7

V

Number of pounds	Number of ounces	ounces
0	2	2
		7
		12
1	1	17

< 16

VI

Number of gallons	Number of quarts	quarts
		27
4	2	18
3	3	
3	0	12
		9
0	0	

< 4

A

Number of nickels	Number of pennies	cents
0	2	2
0	4	4
1	1	6
		8
2	0	10
		12
		18
	less than 5	

B

Number of weeks	Number of days	days
0	1	1
0	3	3
		5
1	0	7
1	2	9
		15
2	3	
	<7	

C

Number of feet	Number of inches	inches
0	2	2
0	5	5
0	8	8
		11
1	2	14
		20
		26
	<12	

D

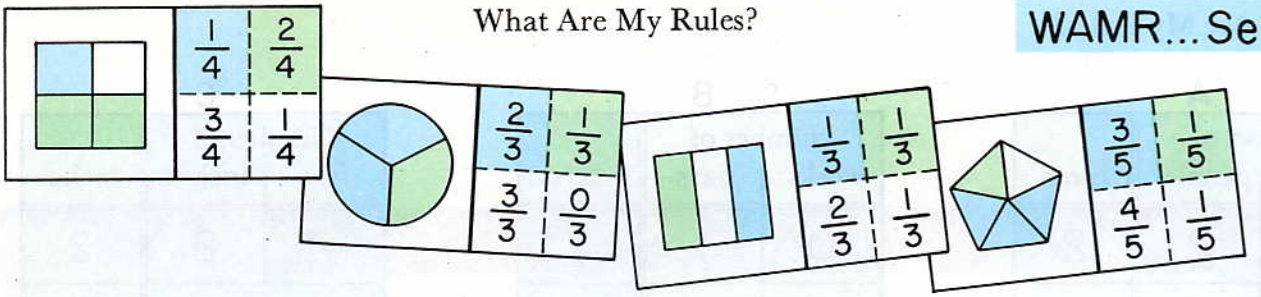
Number of dimes	Number of pennies	cents
0	4	4
0	8	8
1	2	12
		20
		44
	<10	

E

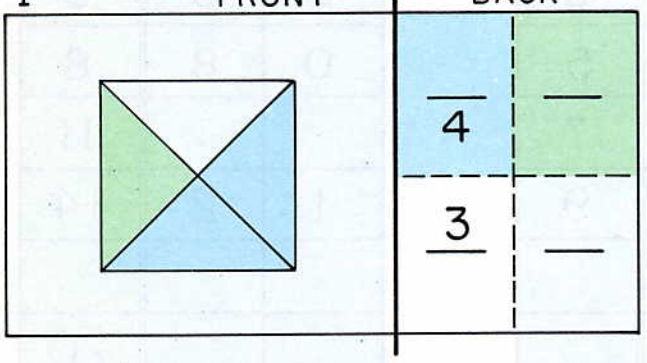
Number of dozen	Number of eggs	eggs
0	5	5
0	10	10
1	3	15
		20
		50
	<12	

F

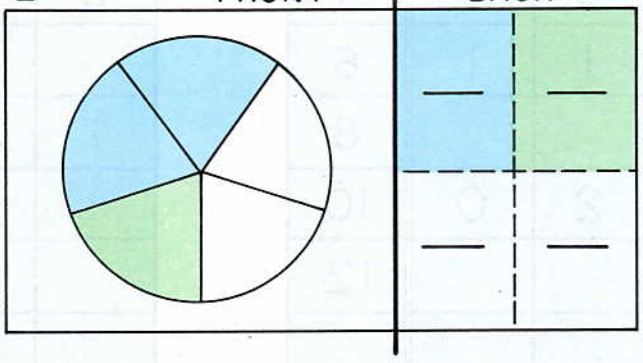
Number of hours	Number of minutes	minutes
0	10	10
		20
		30
		60
		70
	< 60	



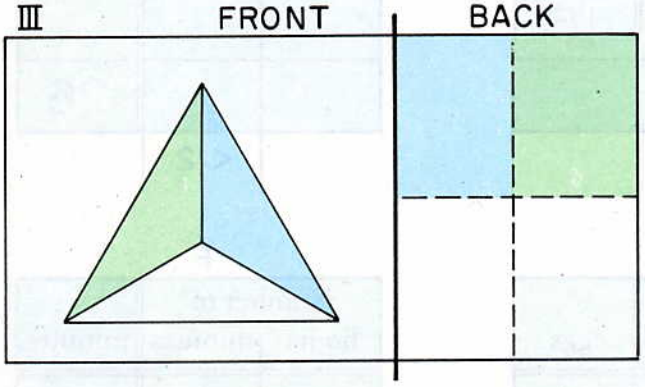
I



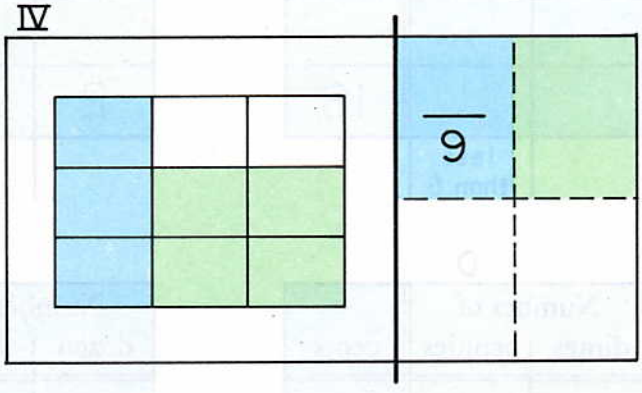
II



III



IV



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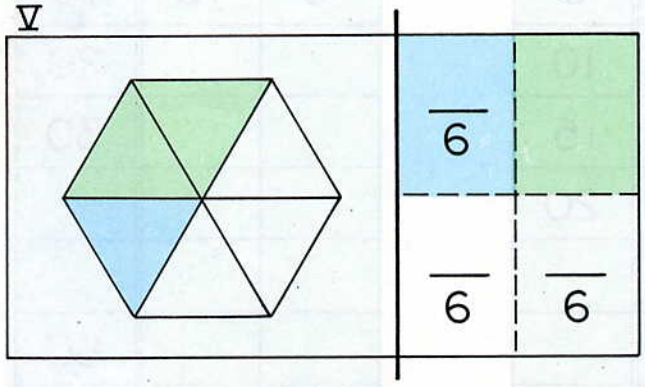
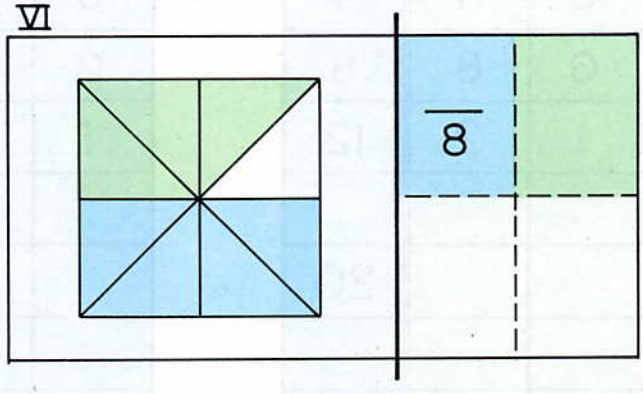
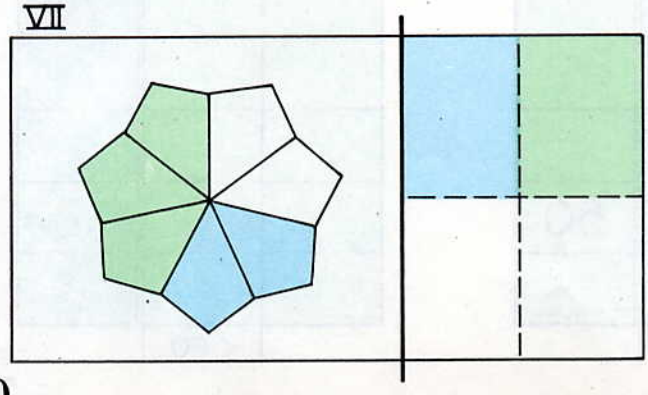


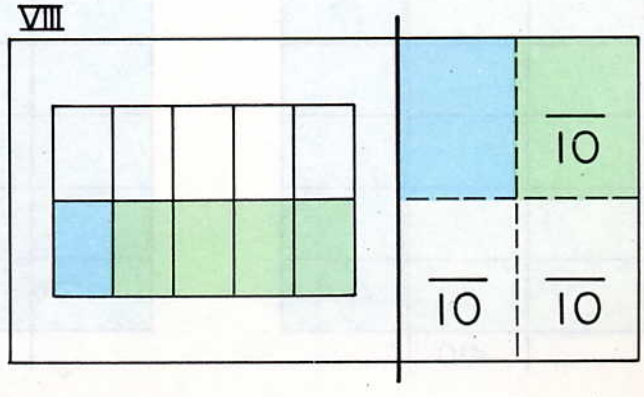
VI

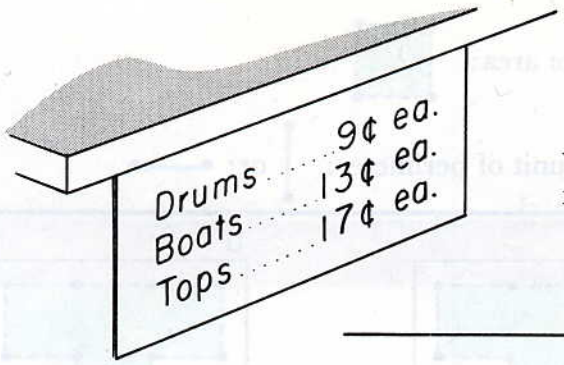


VII



VIII





Harry bought some toys at the toy store where there were drums and boats and tops. He bought fewer than four toys and gave the clerk a dollar.

What can we say?

Suppose that Harry bought only one toy.
He could do that in three ways:

(a) 1 drum _____ ¢; and _____ ¢ change

(b) 1 boat _____ ¢; and _____ ¢ change

(c) 1 top _____ ¢; and _____ ¢ change

Suppose that he bought two toys.

	Number of			Cost of				Change from
	drums	boats	tops	drums	boats	tops	Total cost	$1.00
(d)	2	0	0	18¢	0¢	0¢	18¢	82¢
(e)	1		0					
(f)	1		1					
(g)	0		0					
(h)	0		1	0¢	13¢	17¢	30¢	
(i)			2					

Suppose that he bought three toys.

	Number of			Cost of				Change from
	drums	boats	tops	drums	boats	tops	Total cost	$1.00
(j)	3		0					
(k)	2	1						
(l)	2			18¢	0¢	17¢	35¢	
(m)	1		0					
(n)	1	1						
(o)	1							
(p)			0					
(q)			1					
(r)			2					
(s)								

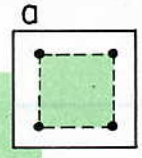
Now, what can you say?

A . . . on these two pages is AREA. Here is one unit of area:

P . . . on these pages is PERIMETER. Here is one unit of perimeter: or:

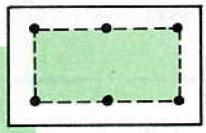
---

a



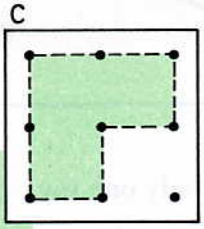
A 1

b



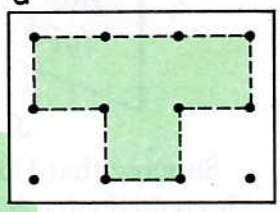
A 2

c



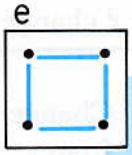
A

d



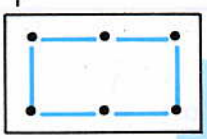
A

e



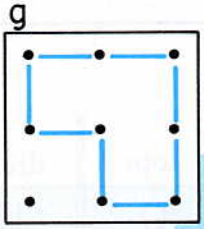
P 4

f



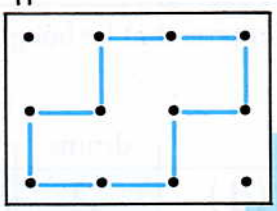
P 6

g



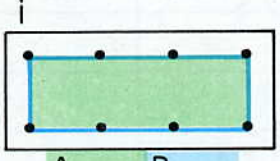
P

h



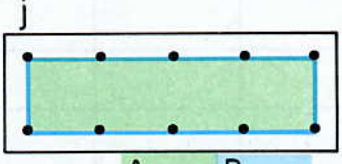
P

i



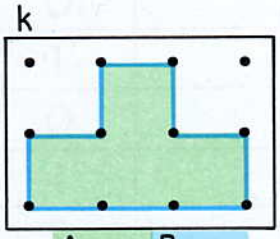
A 3 P 8

j



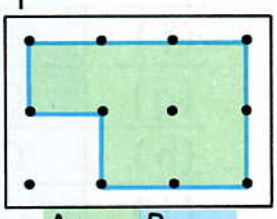
A P

k



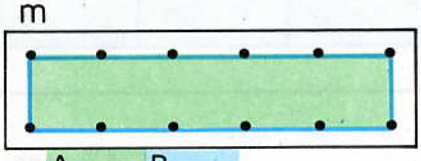
A P

l



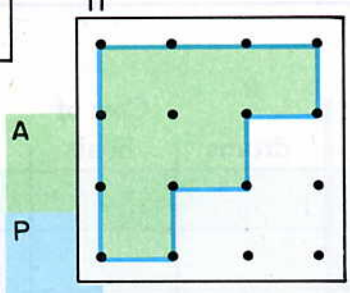
A P

m



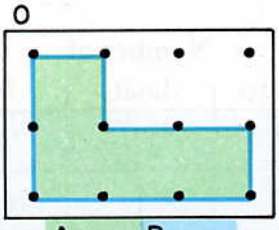
A P

n



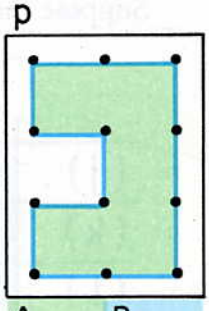
A P

o



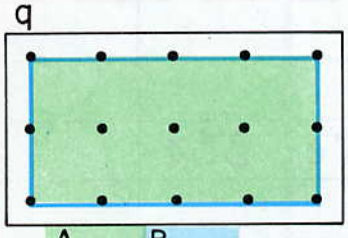
A P

p



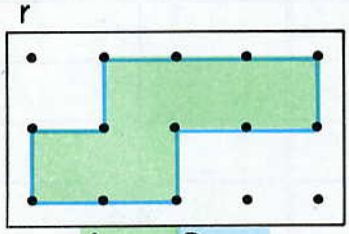
A P

q



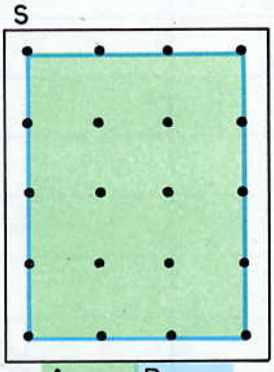
A P

r



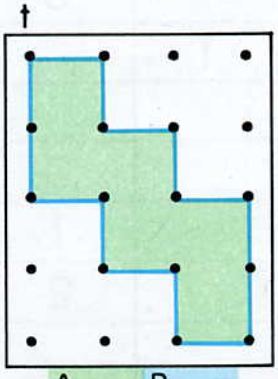
A P

s



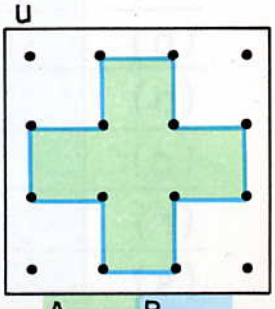
A P

t



A P

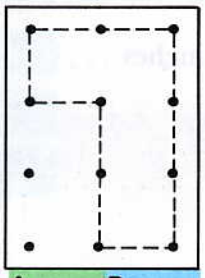
u



A P

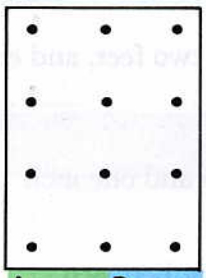
Please draw sketches with AREAS and PERIMETERS as indicated.

I



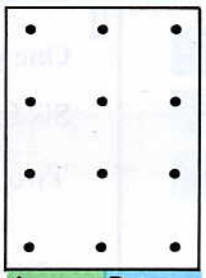
A 4 P 10

II



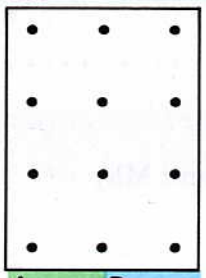
A 5 P 10

III



A 6 P 10

IV



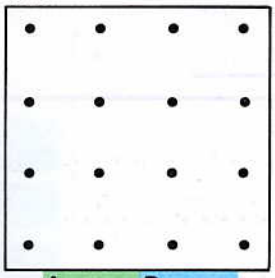
A 5 P 12

(a puzzle)

V

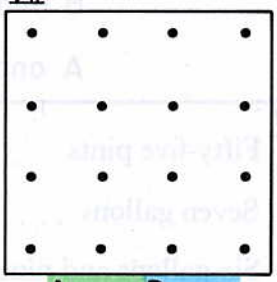
A 9 P 12

VI



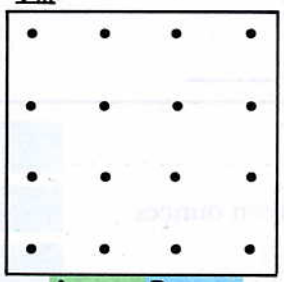
A 8 P 12

VII



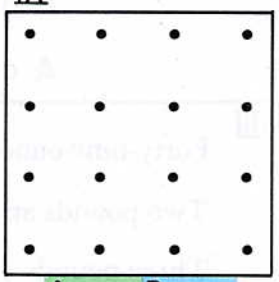
A 6 P 12

VIII



A 5 P 12

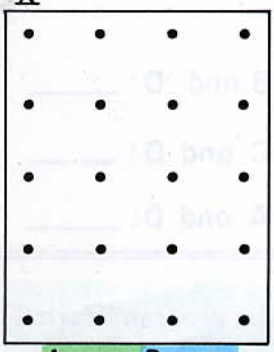
IX



A 8 P 14

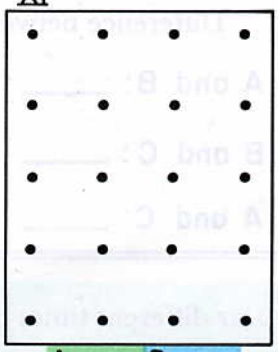
(a puzzle)

X



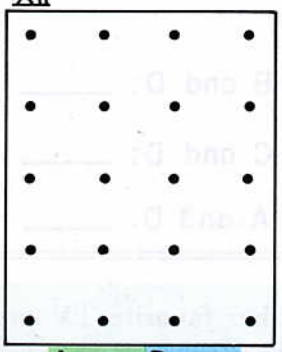
A 11 P 14

XI



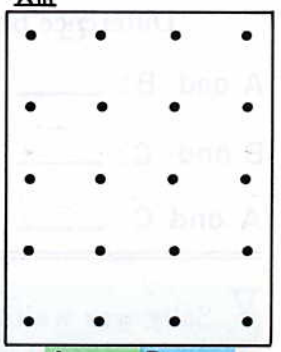
A 12 P 14

XII



A 9 P 14

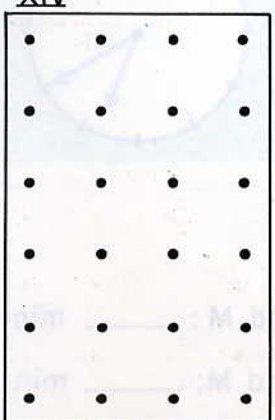
XIII



A 10 P 16

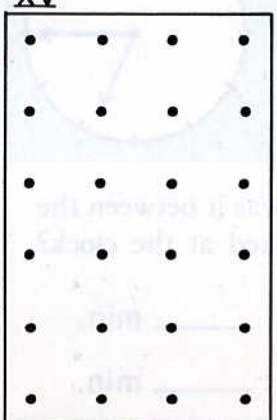
(a puzzle)

XIV



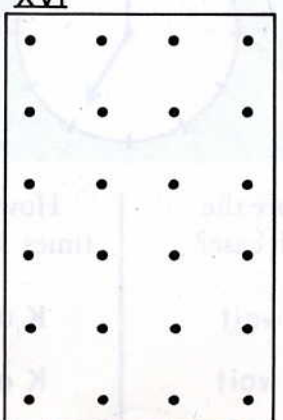
A 7 P 16

XV



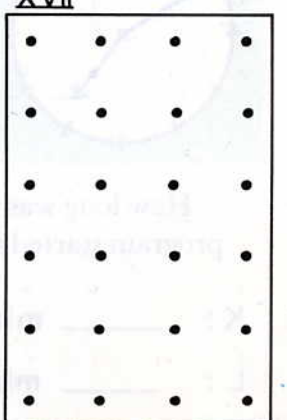
A 15 P 16

XVI



A 10 P 16

XVII



A 11 P 24

(a puzzle)

Show the largest amount with an A in the blue block; the next largest with a B; the next largest with a C, etc. Write the differences in each example.

I

Nine weeks . . . . . ■

Sixty days . . . . . ■

The months of April and May . . . . . ■
together

Difference between

A and B: _____

B and C: _____

A and C: _____

II

One yard, two feet, and eleven inches . . . ■

Six feet . . . . . ■

Two yards and one inch . . . . . ■

Difference between

A and B: _____

B and C: _____

A and C: _____

III

Forty-nine ounces . . . . . ■

Two pounds and eighteen ounces . . . ■

Three pounds . . . . . ■

One pound and thirty-five ounces . . . . ■

Difference between

A and B: _____ B and D: _____

B and C: _____ C and D: _____

A and C: _____ A and D: _____

IV

Fifty-five pints . . . . . ■

Seven gallons . . . . . ■

Six gallons and nine pints . . . . . ■

Four gallons, five quarts, and twelve . . . . ■
pints

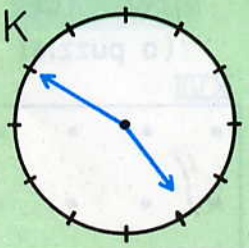
Difference between

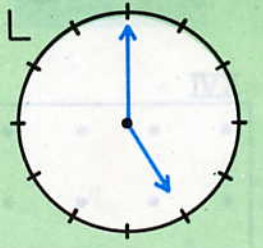
A and B: _____ B and D: _____

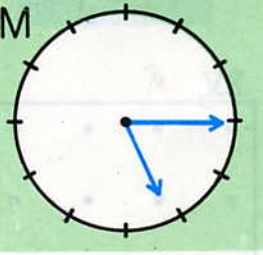
B and C: _____ C and D: _____

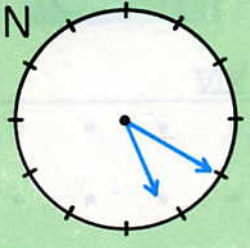
A and C: _____ A and D: _____

V Sally was waiting for her favorite TV program to begin at 5:45. She looked at the clock four different times before the program started:

K 

L 

M 

N 

How long was it before the program started in each case?

K: _____ min. to wait

L: _____ min. to wait

M: _____ min. to wait

N: _____ min. to wait

How long was it between the times she looked at the clock?

K and L: _____ min.

K and M: _____ min.

K and N: _____ min.

L and M: _____ min.

L and N: _____ min.

M and N: _____ min.

Numo the Magician

At a school show, Numo and his sister, Numa, put on a great act. At first, people thought it was magic.

First, someone took Numo out in the hall so that he couldn't see what was going on.

Then Numa asked someone to write a number on the board — one of the whole numbers — 1 thru 32. She would then cover the number with a heavy piece of cardboard and have someone call Numo back into the room.

After a look at Numa, Numo would stare at the cardboard.

"I'll put my x-ray eyes to work," Numo would say. "Through the card I can see the number 17 on the board."

Everyone said, "Wow! He was right!" Numa lifted the card for everyone to see — 17. Mothers and fathers were as surprised as the children.

After Numo did the trick many times without missing, everyone called out, "Tell us how you do it!"

Numo looked at Numa. Should he tell them? After thinking about it for a second, she said, "Let's do it."

Numo Gives the Secret Away

"Well," Numo began, "I'll tell you the secret, if you promise not to tell anyone else."

Everyone called out, "We promise."

"Well, it's very simple. Numa tells me with the fingers on her right hand what the secret number is."

Numo and Numa sat down.

Everyone was quiet for a minute.

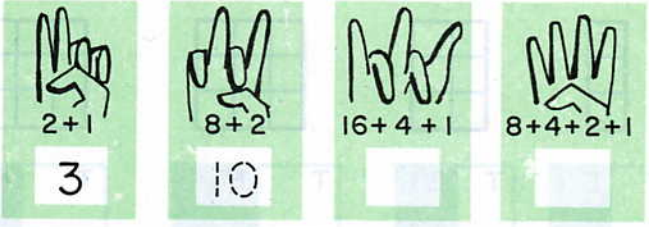
Then someone called out, "How can she do that?"

Numo stood up. "You see, most people can only count to 5 with the fingers of one hand. Numa and I can count to 32 with the same 5 fingers."

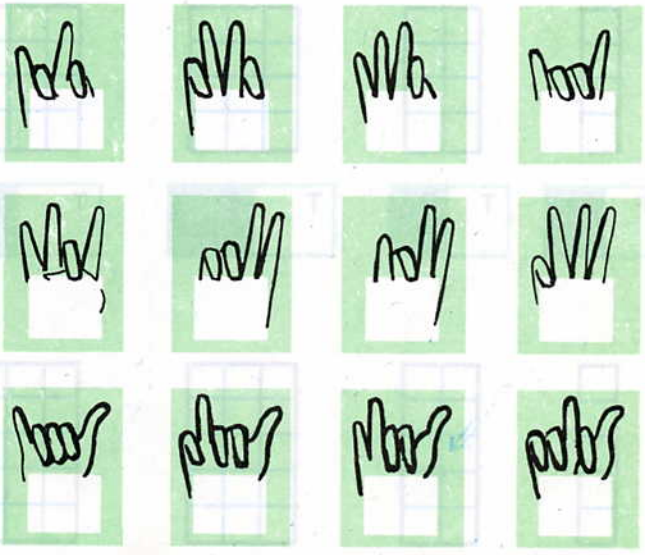
"How can you do it?"

"We do it this way. We let the little finger stand for 1, the ring finger for 2, the middle finger for 4, the forefinger for 8, and the thumb for 16." He drew a picture on the board.

"For other numbers, we use two or more fingers."



"Now you try it. What do these fingers stand for?"

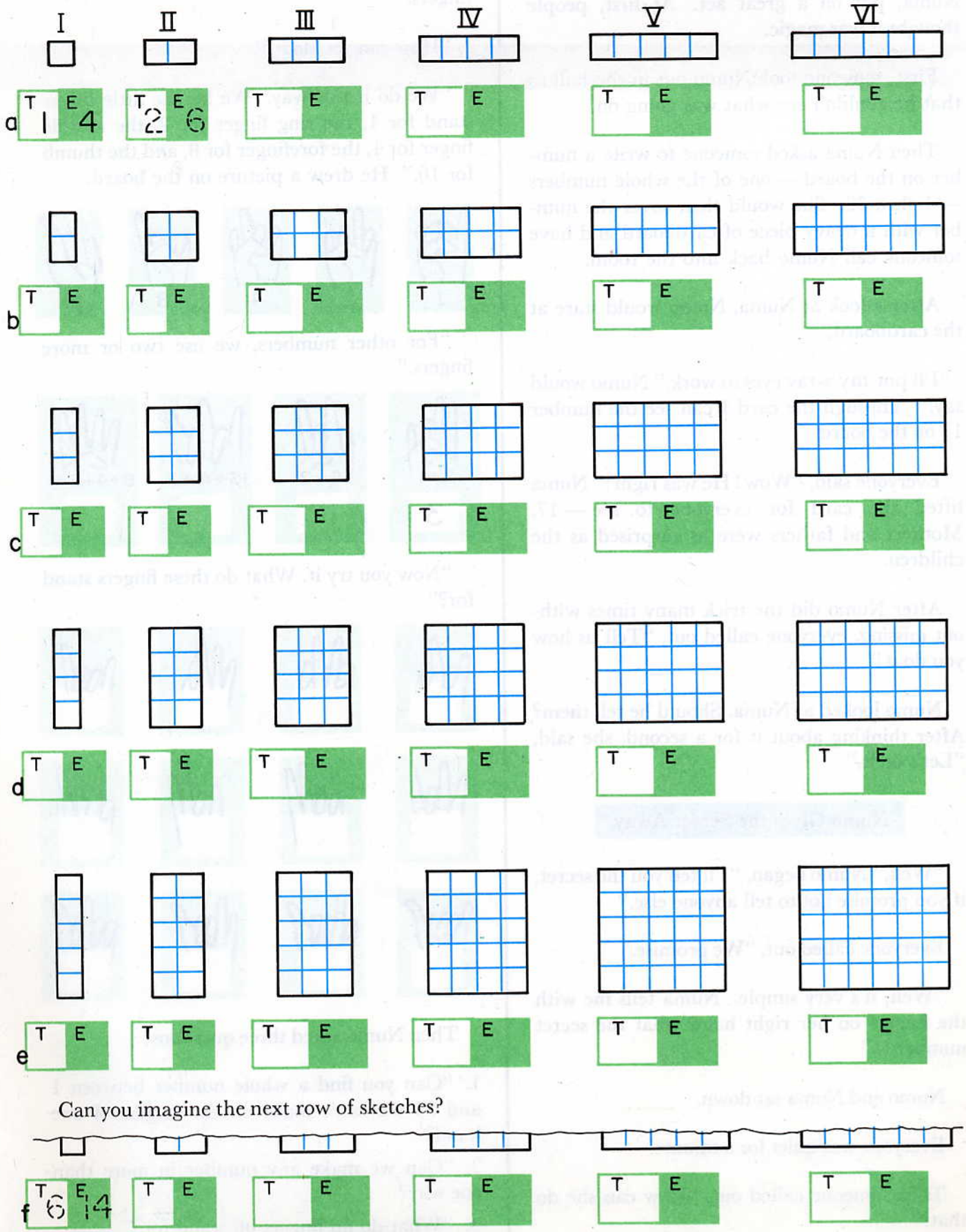


Then Numo asked three questions:

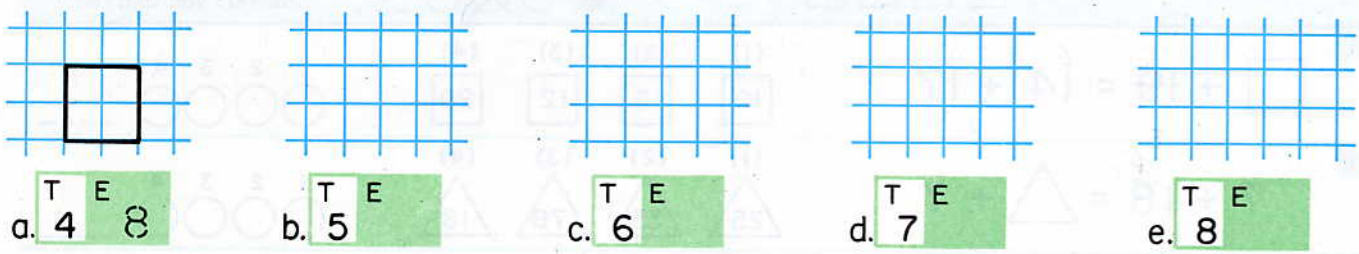
1. "Can you find a whole number between 1 and 32 we can't make on the fingers of one hand?
2. "Can we make any number in more than one way?
3. "What do no fingers up stand for?"

T . . . on these two pages is the number of TILES this size: □

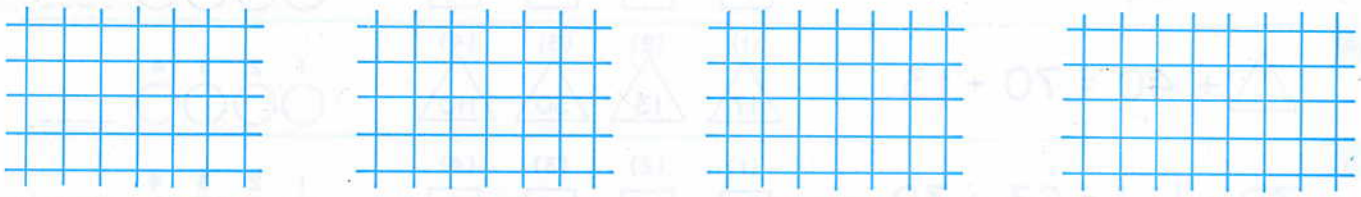
E . . . on these pages is the distance around EDGE in units this size: — or: |



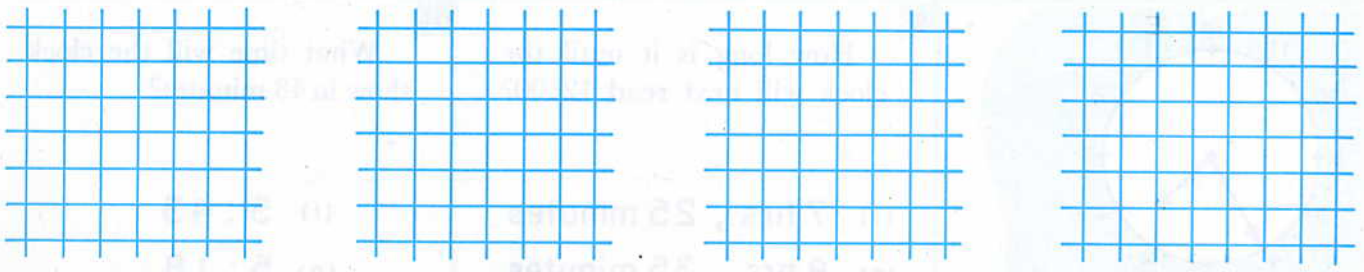
Problem: Show an arrangement of the number of tiles given with the *shortest* distance around the edge.



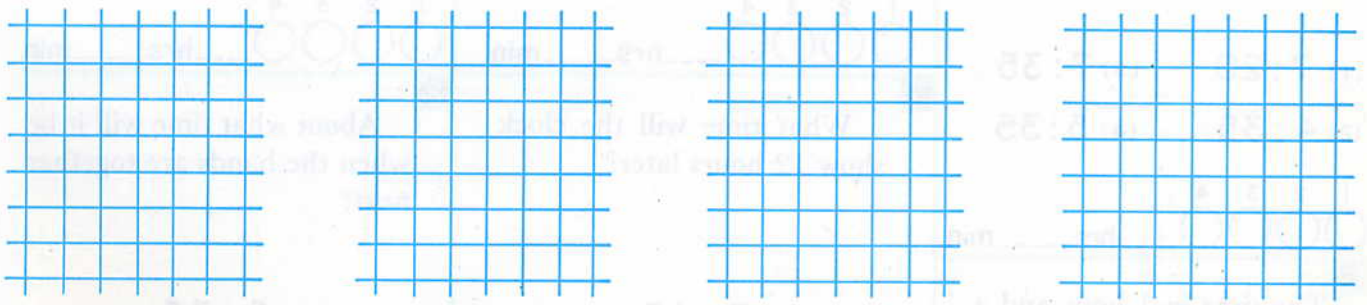
a. T 4 E 8 b. T 5 E c. T 6 E d. T 7 E e. T 8 E



f. T 9 E g. T 10 E h. T 11 E i. T 12 E



j. T 13 E k. T 14 E l. T 15 E m. T 16 E



n. T 17 E o. T 18 E p. T 19 E q. T 20 E

What's My Rule?

0 , 1 , 3 , 6 , 10 , ____ , ____ , ____ , ____ , ____ , 55

$18 + \square = 35 - 10$ (1) 7 (2) 9 (3) 15 (4) 4

Mark correct answer. Mark the furthest from the correct answer.

(1) (2) (3) (4) 8 ← Difference between the answers you marked.

1 $\square + 19 = 14 + 17$ (1) 10 (2) 15 (3) 12 (4) 20 1 2 3 4 ____

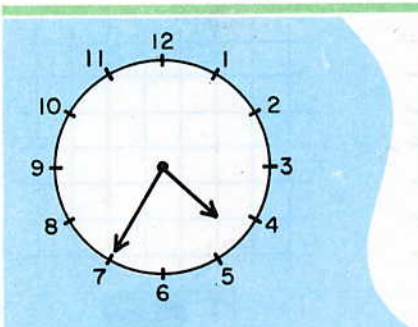
2 $7 + 18 = \triangle + 7$ (1) 25 (2) 35 (3) 78 (4) 18 1 2 3 4 ____

3 $21 + \square = 49 + 21$ (1) 12 (2) 49 (3) 94 (4) 70 1 2 3 4 ____

4 $\triangle + 40 = 70 - 13$ (1) 17 (2) 13 (3) 30 (4) 110 1 2 3 4 ____

5 $39 + \square = 63 + 39$ (1) 57 (2) 36 (3) 93 (4) 63 1 2 3 4 ____

6 $128 + 45 = 45 + \triangle$ (1) 45 (2) 128 (3) 145 (4) 90 1 2 3 4 ____



7 The time shown on the clock is:

(1) 7:20 (3) 7:35

(2) 4:35 (4) 5:35

1 2 3 4 ____hrs.,____min.

8 The time in 1 hour and a half will be:

(1) 5:05 (3) 7:00

(2) 5:35 (4) 6:05

1 2 3 4 ____hrs.,____min.

9 How long is it until the clock will next read 12:00?

(1) 7 hrs., 25 minutes

(2) 8 hrs., 35 minutes

(3) 12 hrs., 0 minutes

(4) 4 hrs., 35 minutes

1 2 3 4 ____hrs.,____min.

10 What time will the clock show 12 hours later?

(1) 3:45

(2) 4:35

(3) 5:34

(4) 4:47

1 2 3 4 ____hrs.,____min.

11 What time will the clock show in 43 minutes?

(1) 5:43

(2) 5:18

(3) 4:43

(4) 6:34

1 2 3 4 ____hrs.,____min.

12 About what time will it be when the hands are together next?

(1) 5:35

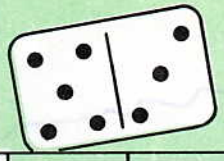
(2) 12:00

(3) 6:00

(4) 5:27

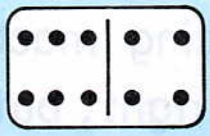
1 2 3 4 ____hrs.,____min.

A.



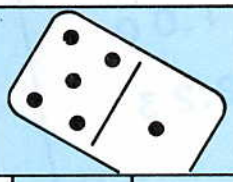
		x 2	x 3	x 5
+ 9	+	x 4	x 6	x 10
	20			

B.



		x 2	x 3	x 5
+	+	x 6	x 9	x 15
18	27			

C.



		x 3	x 2	x 5
+ 17	+ 45	x 6	x 4	x 10

D.

		x 2	x 3	x 5
x 20	x 30	x 4	x 6	x 10

E.

twice as much

2 nickels, 4 pennies

three times as much (use fewest coins)

___ n., ___ p.

four times as much (use fewest coins)

___ n., ___ p.

9¢ more (use fewest coins)

___ n., ___ p.

13¢ more (use fewest coins)

___ n., ___ p.

F.

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

twice as many days as those shaded green

2 weeks, 6 days

three times as many days as those shaded green

___ wk., ___ da.

four times as many days as those shaded green

___ wk., ___ da.

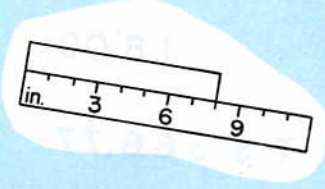
9 days more than those shaded green

___ wk., ___ da.

13 days more than those shaded green

___ wk., ___ da.

G.



a one foot ruler

length of block

___ feet, ___ inches

twice as long

___ ft., ___ in.

three times as long

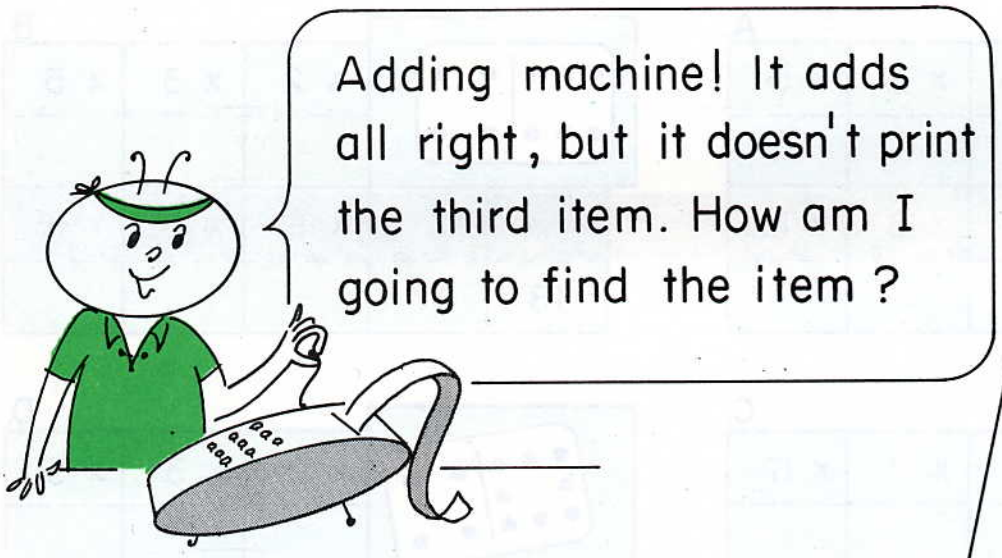
___ ft., ___ in.

half as long

___ ft., ___ in.

four times as long

___ ft., ___ in.



A.

$ .25
.36

.24
1.00

T $ 2.23

B.

$ 125.00
15.93

18.09

T $ 366.77

C.

$ 302.85
48.67

100.00
17.28

T $ 557.35

D.

$ 1.08
.56

.83
2.12
.75
1.56
.50
1.10
.12
.07

T $ 10.16

E.

$ 355.75
25.00

34.83
19.66

T $ 635.24

F.

$ .30
1.00

10.50
2.25
3.75
.90
3.07
6.10
1.04
30.00
5.68

T $ 76.93

G.

$ 2,350.00
750.85

487.99

T $ 5,114.09

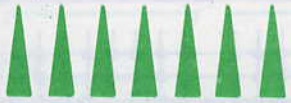
H.

$ 10.25
5.62

37.48
.56
1.27

T $ 65.18

A.



a row of 7 blocks

twice as many	14	three times as many	
5 rows of blocks		ten times as many	

B.

a row of 14 blocks

half as many		twice as many	
ten times as many		three times as many	
		five times as many	

C.

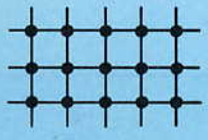
A A A A A B B B B B B B B B

a row with 5 A's and 9 B's

The total number of letters is

		three times as many A's	
		three times as many B's	
		three times as many letters	
five times as many letters		ten times as many letters	

D.



		x 2	x 3	x 5
− 8	+ 9	x 4	x 6	x 10

E.

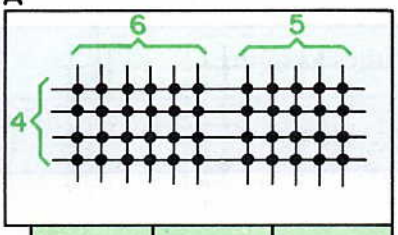
11.
(shorthand for twenty-one)

		x 2	x 3	x 5
+ 39	+	x 4	x 6	x 10
	100			

F.

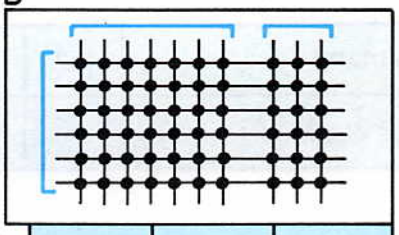
3 times as much		6 times as much	
2 times as much		4 times as much	
5 times as much		10 times as much	
7 times as much		14 times as much	
half as much		one dollar more	

A



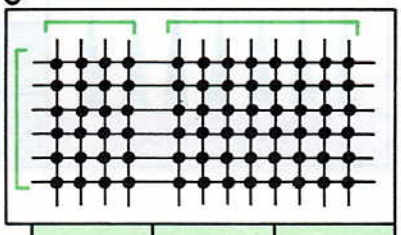
6 x 4	5 x 4	11 x 4

B



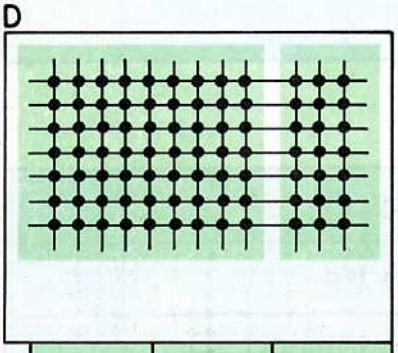
7 x 6	x 6	x 6

C



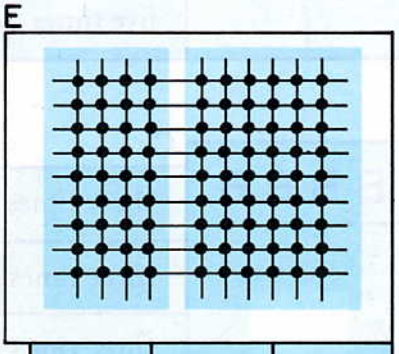
4 x 6	x 6	x 6

D



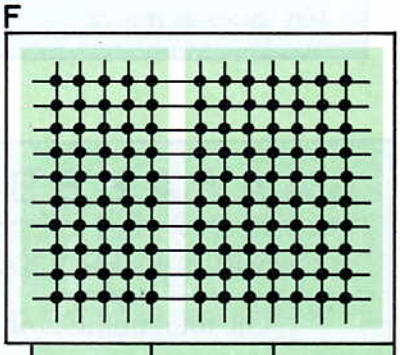
9 x 7	x 7	x 7

E



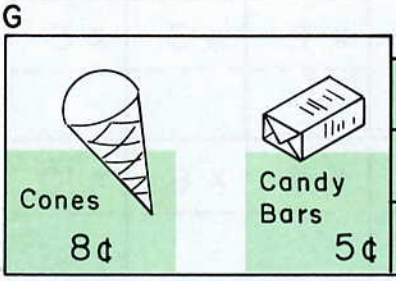
4 x 9	x 9	x 9

F



5 x 10	x 10	x 10

G



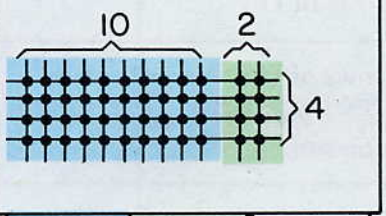
cost of 5 cones	¢	15 cones	$
cost of 5 bars	¢	15 bars	$
cost of 5 of each	¢	15 of each	$

H

8 half-dollars		12 half-dollars	
8 quarters		12 quarters	
8 dimes		12 dimes	
8 nickels		12 nickels	
8 of each		12 of each	

I.

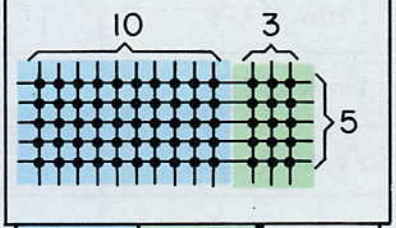
12 x 4 =



10 x 4 = 40	2 x 4	12 x 4

II.

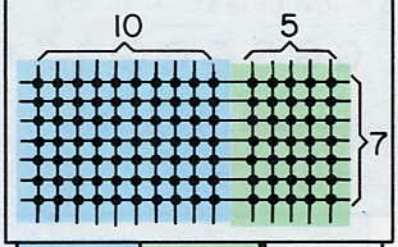
13 x 5 =



10 x 5	3 x 5	13 x 5

III.

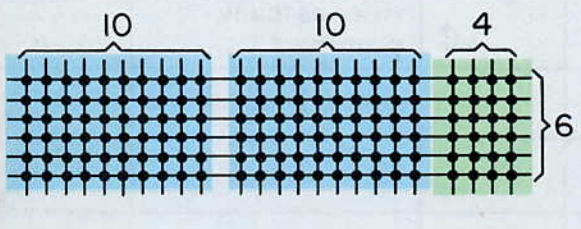
15 x 7 =



10 x	5 x	15 x

IV.

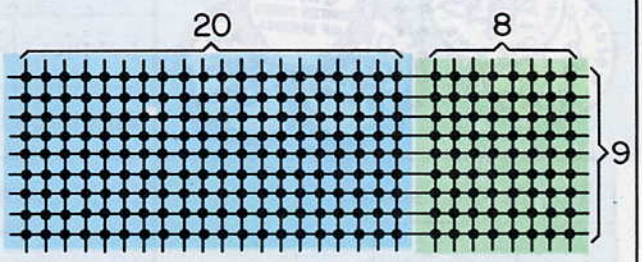
24 x 6 =



10 x 6	10 x 6	20 x 6	4 x 6	24 x 6

V.

28 x 9 =

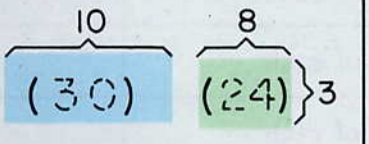


20 x 9	8 x 9	28 x 9

Let's begin imagining the lines and crossing points.

VI.

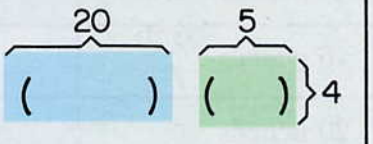
18 x 3 =



10 x 3	8 x 3	18 x 3

VII.

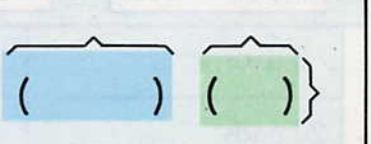
25 x 4 =



20 x 4	x 4	25 x 4

VIII.

35 x 6 =



30 x 6	x 6	35 x 6

IX.

3 x _____	4	2	6	8	14	22	36	58	94	152	246	398
	12	6	18			66						

What Are My Rules?

A

How many letters?

A row of G's: G G G G G G G G G G A row of H's: H H H H					
		1 row of G's	10	6 rows of G's	
		1 row of H's		6 rows of H's	
		1 row of each		6 rows of each	
4 rows of G's		10 rows of G's		14 rows of G's	
4 rows of H's		10 rows of H's		14 rows of H's	
4 rows of each		10 rows of each		14 rows of each	

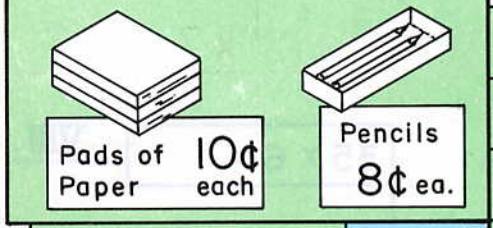
B

What are the coins worth?

		dimes shown	20¢	twice as many dimes	
		pennies shown	3¢	twice as many pennies	
		amount shown		twice amount shown	
5 × pennies shown		10 × pennies		15 × pennies	
5 × dimes shown		10 × dimes		15 × dimes	
5 × all coins	$1.15	10 × all coins		15 × all coins	

C

What is the cost?

					
		2 pencils		2 of each	36¢
		5 pencils		5 of each	
		7 pencils		7 of each	
6 pads		6 pencils		6 of each	
20 pads		20 pencils		20 of each	
26 pads		26 pencils		26 of each	

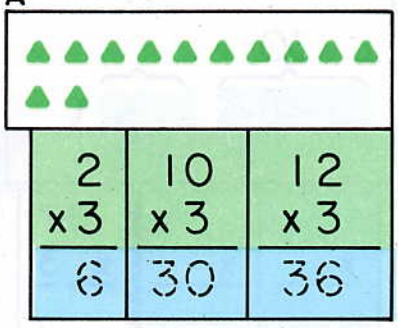
D

7x	5	10	15
	35	70	

10x	5	10	15
		100	

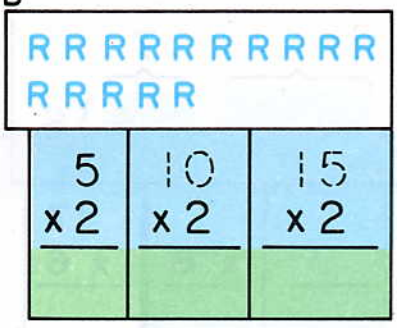
17x	5	10	15

A



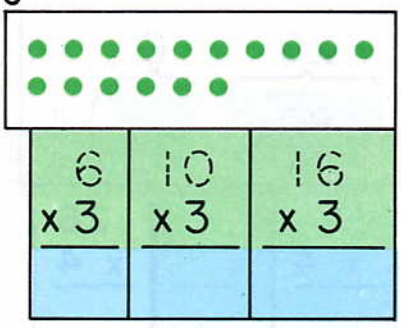
2	10	12
x 3	x 3	x 3
6	30	36

B



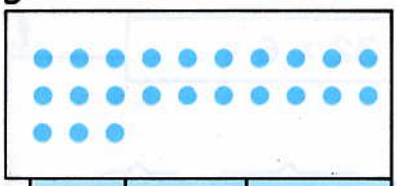
5	10	15
x 2	x 2	x 2

C



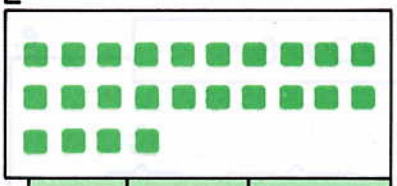
6	10	16
x 3	x 3	x 3

D



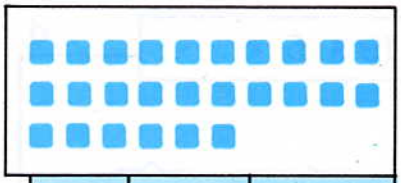
3	20	23
x 3	x 3	x 3

E



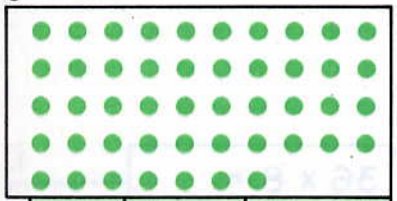
	20	24
x 3	x 3	x 3

F



6		
x 4	x 4	x 4

G



7		
x 5	x 5	x 5

H

x 6	x 6	x 6

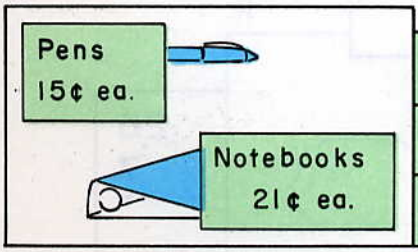
I

x 7	x 7	x 7

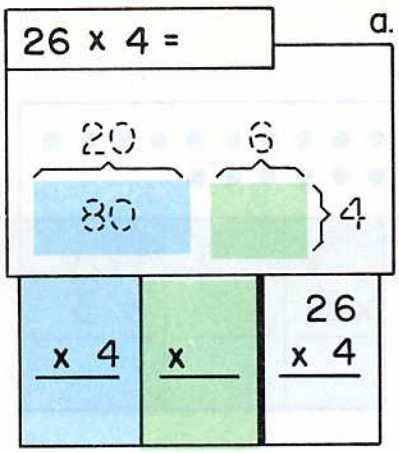
J

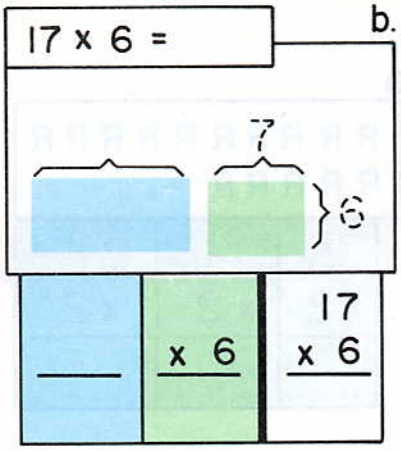
3 doz. eggs	eggs	5 doz. eggs	eggs
6 doz. eggs	eggs	10 doz. eggs	eggs

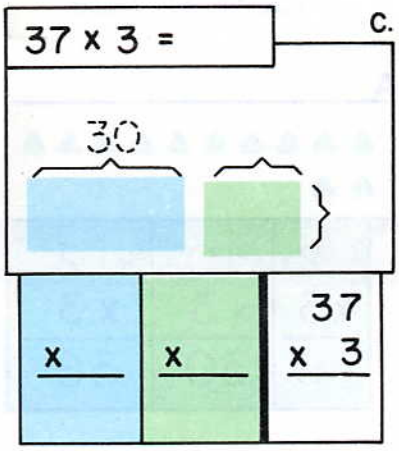
K

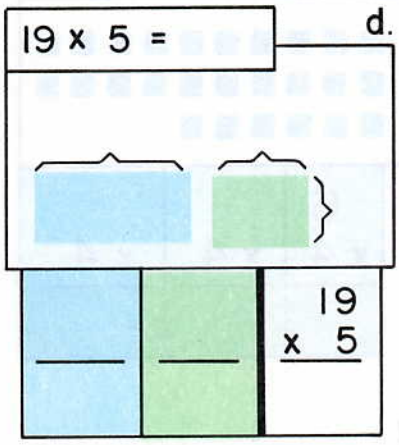


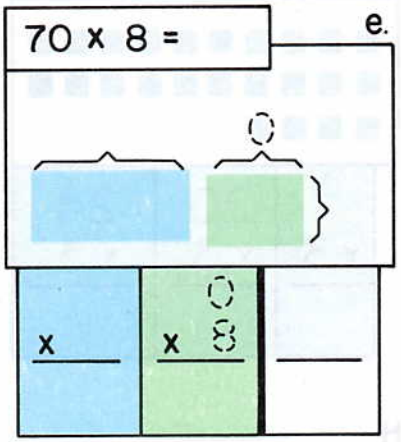
3 pens	¢	7 pens	$
3 notebooks	¢	7 notebooks	$
3 of each	$	7 of each	$

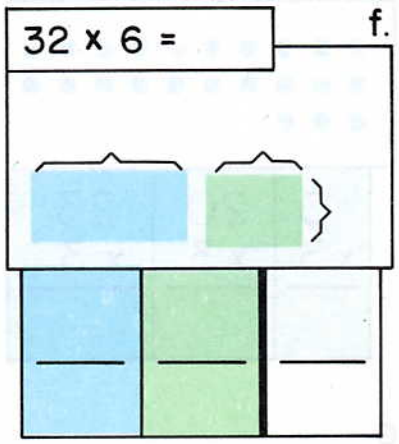




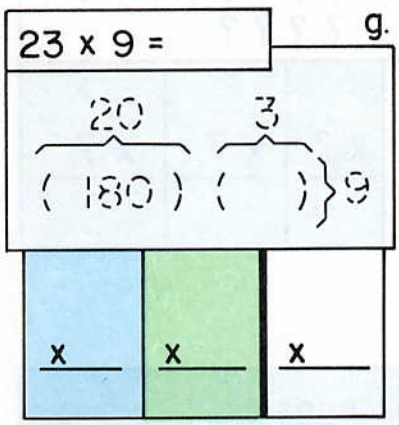


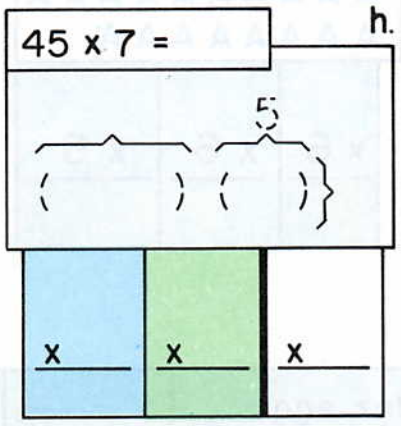


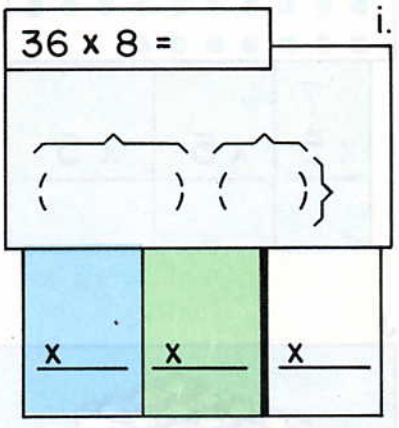




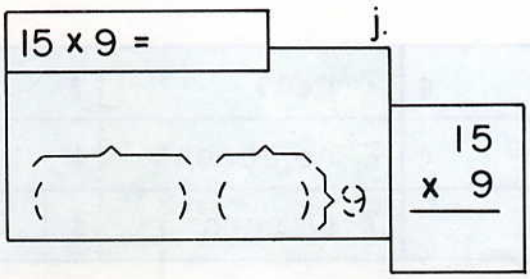
You don't need the colored blocks to show where the crossing points would be.

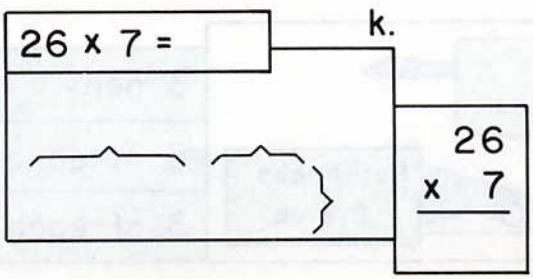






We have left out some of the steps we used above. Work on scratch paper if you wish to write the steps we left out.





In doing the following examples, you should imagine the sketches. Use a piece of scratch paper to draw a sketch whenever you are in doubt.

A

14 x =

10 x ___	4 x 6	x ___

B

x =

x ___	x ___	21 x 7

C

x 5 =

10 x ___	8 x ___	x ___

D

12 x 3 =

x ___	x ___	x ___

E

16 x 6 =

x ___	x ___	x ___

F

13 x 7 =

x ___	x ___	x ___

G

16 x 5 =

x ___	x ___	x ___

H

25 x 6 =

x ___	x ___	x ___

I

24 x 6 =

x ___	x ___	x ___

J

x 4 = 48

x4 ___	x4 ___	x4 48

K

x 5 = 125

x ___	x ___	x ___

L

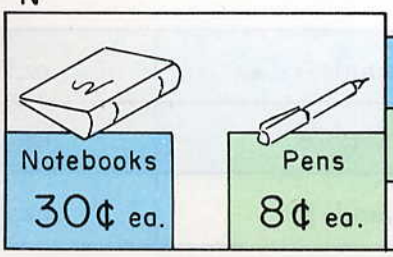
x 6 = 162

x ___	x ___	x ___

M

twice as many dimes	¢	9 times as many dimes	$.
twice as many pennies	¢	9 times as many pennies	$.
twice as much as 13¢	¢	9 times as much as 13¢	$.

N



½ dozen notebooks	$.	a dozen notebooks	$.
½ dozen pens	$.	a dozen pens	$.
½ dozen of each	$.	a dozen of each	$.

A

31 x 5 = ____

x ____ x ____

31
x 5

B

x = ____

____ ____

15
x 3

C

x = ____

____ ____

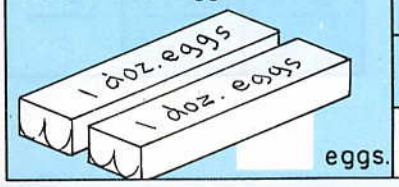
23
x 8

Try to complete the following in the shortest way you can. Use scratch paper if you wish.

	I	II	III	IV	V	VI	VII	VIII	IX
D	64 x 2 =	x 4 = 52	x 4 = 104	40 x 6 =	58 x 3 =	25 x ____ = 150	75 x ____ = 375	x 9 = 135	60 x 5 =
E	20 x 8 =	x 5 = 200	x 9 = 216	24 x 3 =	24 x 5 =	24 x 8 =	x 7 = 224	x 2 = 64	32 x 9 =
F	36 x 3 =	36 x 7 =	36 x 10 =	25 x 7 =	25 x 9 =	25 x 16 =	16 x 5 =	16 x 10 =	16 x 15 =

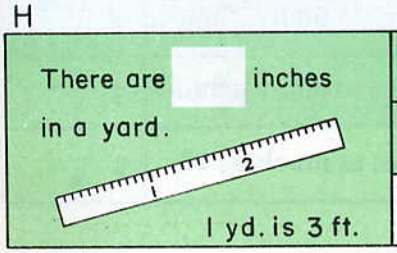
If you found shortcuts as you completed the examples above, talk to others about your findings. Share your discoveries.

G



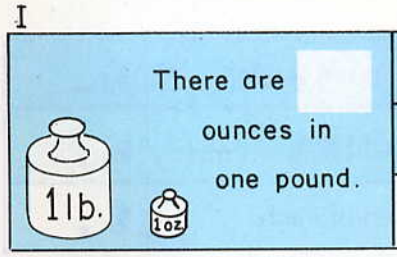
3 times as many	eggs	4 times as many	
5 times as many		6 times as many	
8 times as many		10 times as many	

H



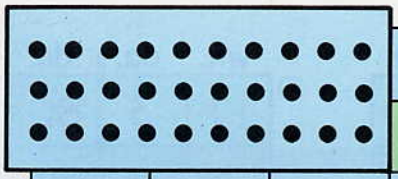
2 yards is	in.	3 yards is	in.
4 yards is	in.	7 yards is	in.
6 yards is	in.	10 yards is	in.

I



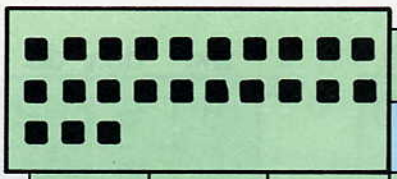
3 pounds is	oz.	5 pounds is	oz.
8 pounds is	oz.	10 pounds is	oz.
11 pounds is	oz.	15 pounds is	oz.

A



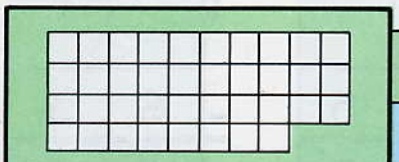
			+25	−8
−13	+		−19	
	46	10		100

B



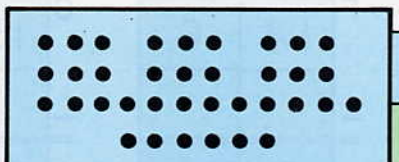
			+27	−15
−				
3	30	75	18	100

C



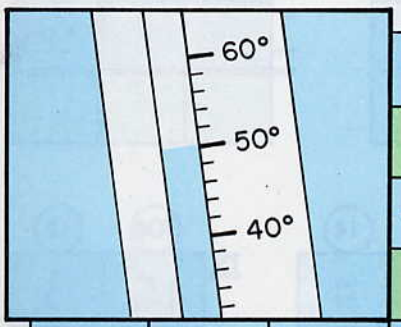
			+2	−20
		−29		
15	51		76	100

D



			−6	+8
50	11	18	0	100

E



			+10°	−5°
			°	°
			+33°	−13°
			°	°
+ °	°	°	°	°
84°	27°	75°	12°	100°

F

			+9¢	−9¢
			−25¢	+50¢
	−36¢			
27¢		11¢	$1.00	80¢

G

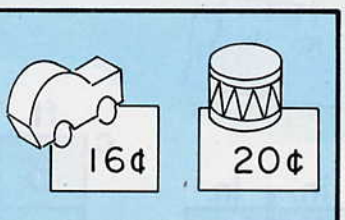
twice as much

____ ¢

half as much

____ ¢

H



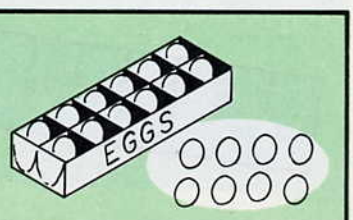
3 drums and 1 car

____ ¢

2 of each

____ ¢

I



twice as many eggs

____ doz., ____ eggs

half as many eggs

____ doz., ____ eggs

A

wk.	da.	da.
7	1	50
2	0	14

<7

B

wk.	da.	da.
8	6	62
2	6	20

C

wk.	da.	da.
10	0	70
3	1	22

D

wk.	da.	da.
11	3	80
3	5	26

E

wk.	da.
10	5
3	4

F

wk.	da.
12	6
8	4

G

wk.	da.
15	
	0
10	0

H

wk.	da.
17	
5	5
	3

I

wk.	da.
6	3
12	6

I

10¢	1¢	cents
8	7	87
3	4	34

<10

II

10¢	1¢	cents
13	8	138
		97

III

10¢	1¢	cents
		76
		57

IV

10¢	1¢	cents
12		129
		98

V

10¢	1¢
10	0
8	3

VI

10¢	1¢
13	8
2	9

VII

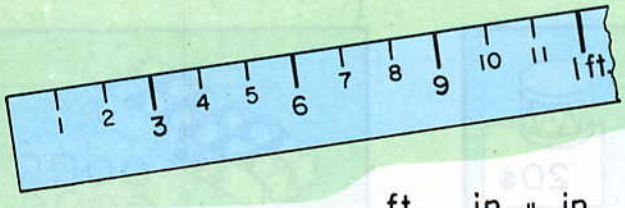
10¢	1¢
8	9
1	1

VIII

10¢	1¢
32	4
23	5

IX

10¢	1¢
15	3
6	
	1



a

ft.	in.	in.
3	0	36
5	4	64

<12

b

ft.	in.	in.
5	3	63
3	10	46
		12

c

ft.	in.	in.
3	9	45
3	8	44
		28
		27

d

ft.	in.	in.
		19
		39
	11	59
		29
	11	23

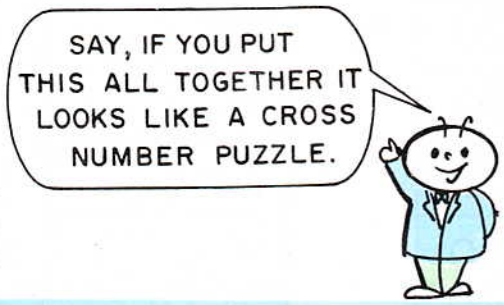
All About Weeks and Days

wk.	da.
0	3
+ 0	6
1	2

wk.	da.
1	0
+ 1	1
2	1

wk.	da.	wk.	da.	wk.	da.
1	2	2	1	3	

wk.	da.	wk.	da.	wk.	da.
0	3	1	0	1	3
0	6	1	1		



wk.	da.
1	3
+ 2	0

A

wk.	da.	wk.	da.	wk.	da.
1	3	1	2		
3	1	1	0		

B

wk.	da.	wk.	da.	wk.	da.
2	3	1	2		
2	1	2	1		

C

wk.	da.	wk.	da.	wk.	da.
1	6	2	5		
4	5	4	4		

D

wk.	da.	wk.	da.	wk.	da.
				6	3
				5	4
6	3	5	4		

All About Nickels and Pennies

E

5¢	1¢	5¢	1¢	5¢	1¢
0	4	1	1	2	0
0	2	2	3		
1	1				

F

5¢	1¢	5¢	1¢	5¢	1¢
1	3	1	4		
3	4	2	4		

G

5¢	1¢	5¢	1¢	5¢	1¢
4	3	4	3		
5	2	5	2		

H

5¢	1¢	5¢	1¢	5¢	1¢
9			4	17	3
7				22	2
17	3	22	2		

I

min.	sec.	sec.
0	20	20
		40
	0	60
		80
		100
		120
		140
		160
		180
		200
	< 60	

II

$\frac{1}{4}$ hr.	min.	min.
0		8
		13
		18
		23
		28
		33
2		38
		53
	< 15	

III

$\frac{1}{2}$ hr.	min.	min.
1	9	39
1	19	
1	29	
2	9	
		79
4	9	
	< 30	

IV

da.	hrs.	hrs.
		9
		17
		25
		33
		41
		57
		65
		81
	< 24	

V

wk.	da.	da.
1	0	
		16
		19
		22
		25
4	6	
	< 7	

VI

yr.	mo.	mo.
		8
		14
		20
		26
	< 12	

What Are My Rules?

I

10¢	5¢	1¢	cents
			5
			9
1	1	0	
			23
			33
			45
5	1	4	59
			75
			93
11	0	3	
	<2	<5	

II

yd.	ft.	in.	in.
			5
			11
0	1	8	20
			32
1	0	11	47
			65
			86
			110
			137
4	1	11	
	<3	<12	

III

25¢	5¢	1¢	cents
			9
			19
			34
2	0	4	54
3	0	4	
4	1	4	
			144
			184
			229
11	0	4	
	<5	<5	

IV

wk.	da.	da.
		1
		5
		11
		19
		29
5	6	41
		55
10	1	71
		89
		109
	<7	

V

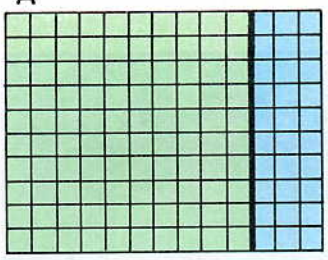
gal.	qt.	$\frac{1}{2}$ pt.	$\frac{1}{2}$ pt.
			1
			3
			6
			10
0	3	3	15
1	1	1	21
1	3	0	
2	1	0	
2			45
3	1	3	
	<4	<4	

VI

$1	10¢	1¢	cents
			4
			16
			34
			58
			88
1	2	4	
1		6	166
2	1		214
	6	8	268
			328
	<10	<10	

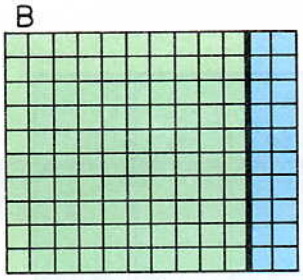
How Many Tiny Squares?

A



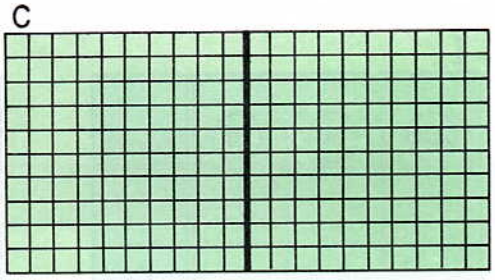
13 x 10 = ____

B



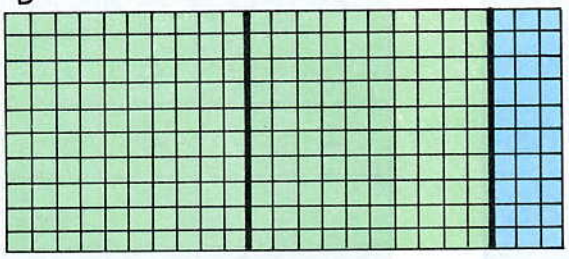
12 x 10 = ____

C



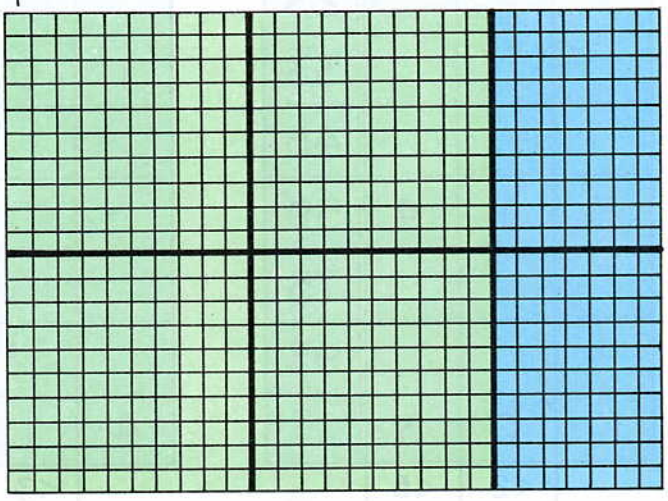
20 x 10 = ____

D



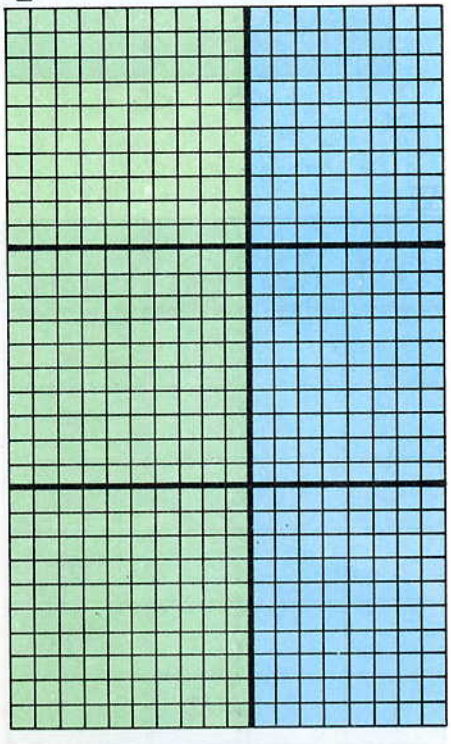
23 x 10 = ____

F



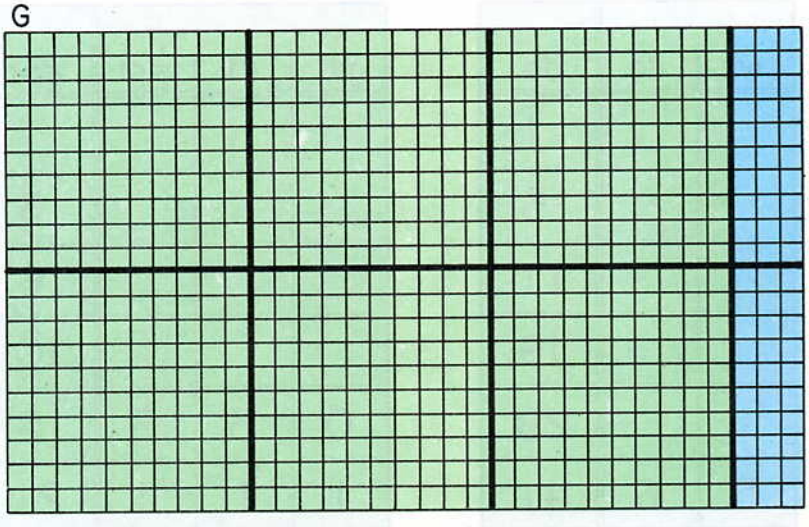
27 x 20 = ____

E



18 x __ = _____

G



33 x __ = _____

a. 13 x10

b. 12 x10

c. 20 x10

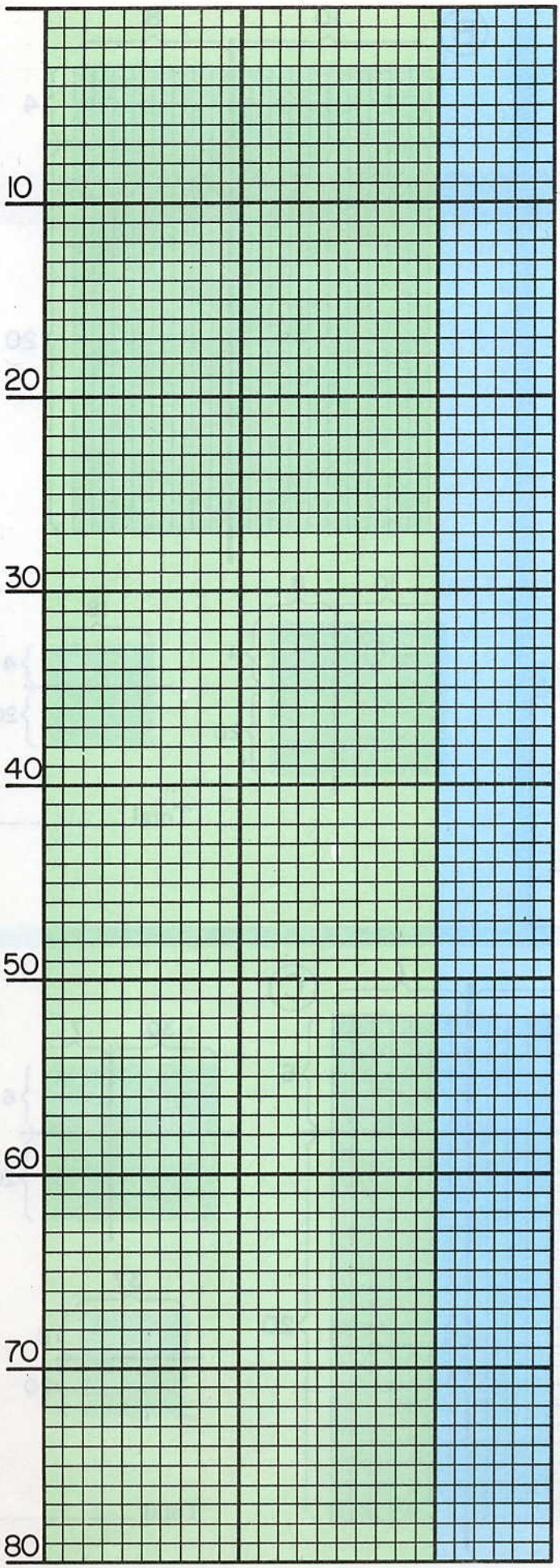
d. 23 x10

e. 18 x30

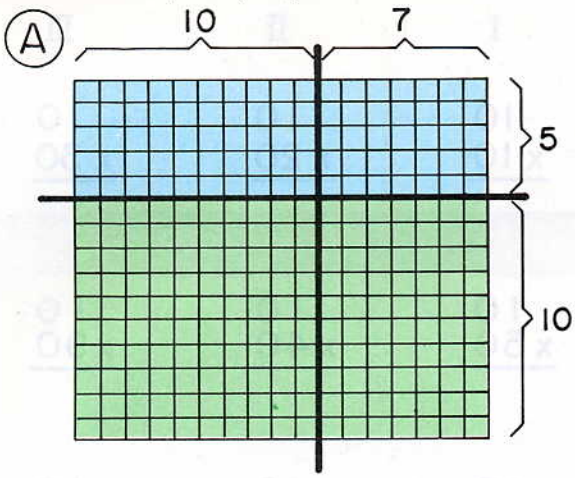
f. 27 x20

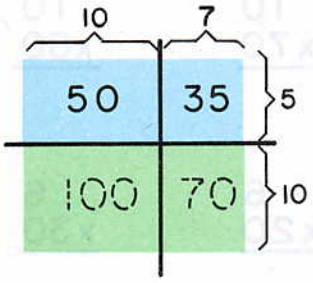
g. 33 x20

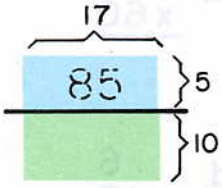
h. 60 x20



	I	II	III
a.	10 x 10	10 x 20	10 x 30
b.	10 x 50	10 x 40	10 x 90
c.	10 x 60	10 x 70	10 x 80
d.	6 x 10	6 x 20	6 x 30
e.	6 x 50	6 x 40	6 x 90
f.	6 x 60	6 x 70	6 x 80
g.	20 x 10	20 x 20	20 x 30
h.	20 x 50	20 x 40	20 x 90
i.	26 x 10	26 x 20	26 x 30
j.	26 x 50	26 x 40	26 x 90

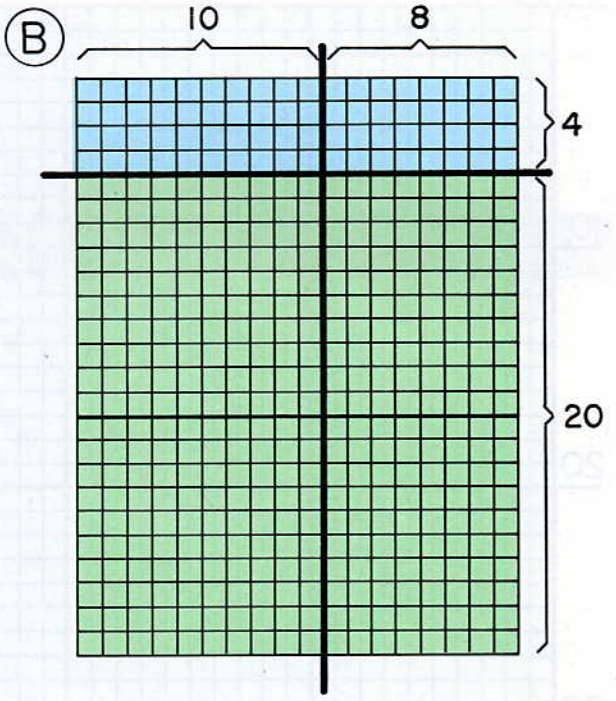


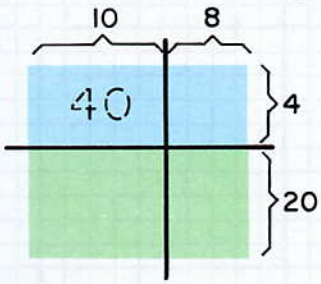


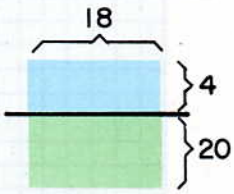


Total _____

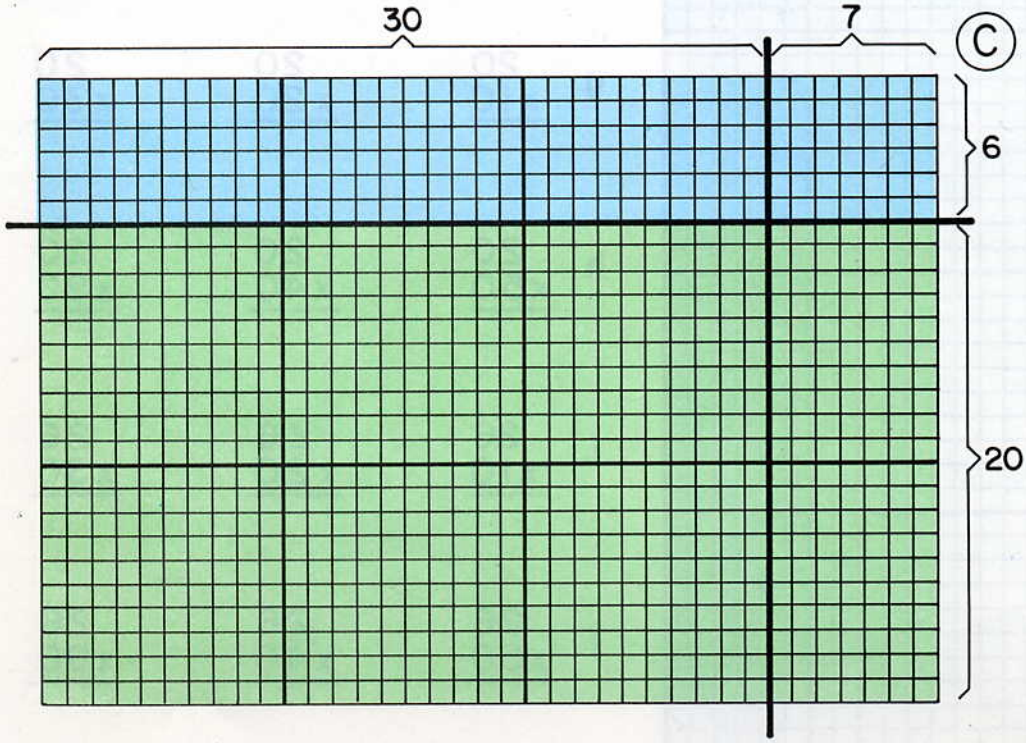
A	B	C
17 x 15 = 85	18 x 24 =	37 x 26 =

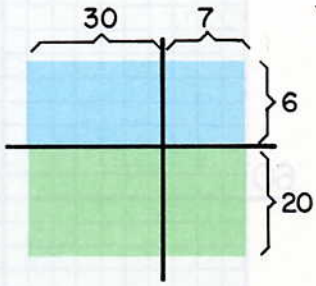


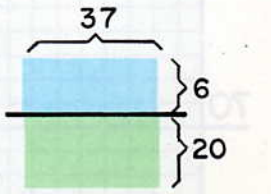




Total _____

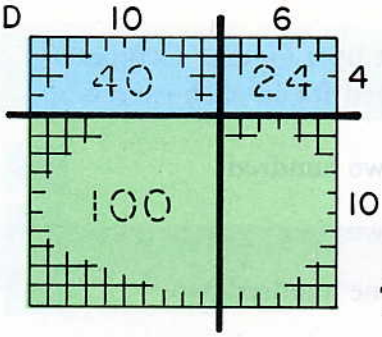






Total _____

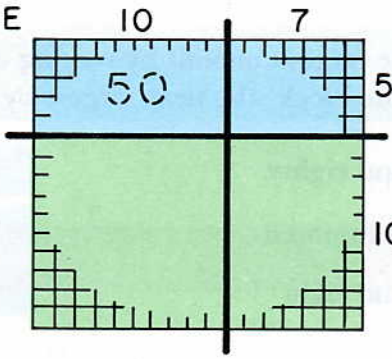
D



64

Total _____

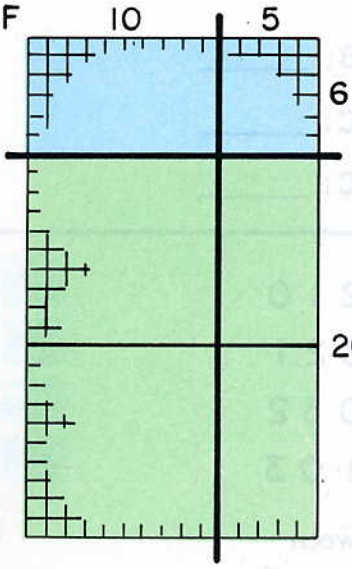
E



Total

_____

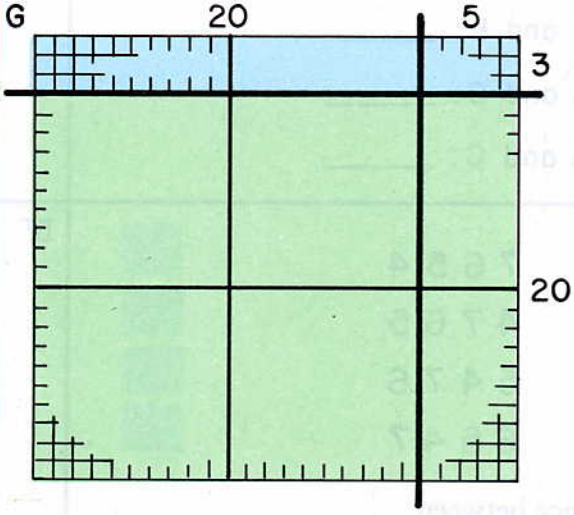
F



Total

_____

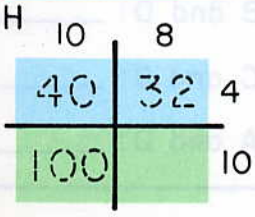
G



Total

_____

H

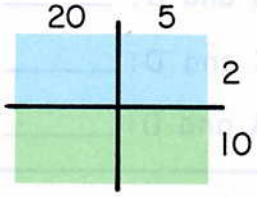


72

180

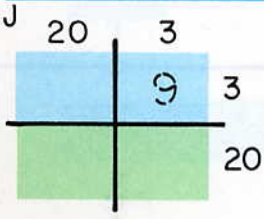
18
x 14
72
180
2

I



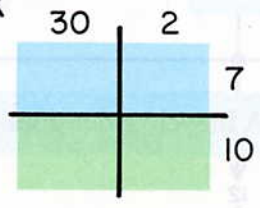
25
x 12

J



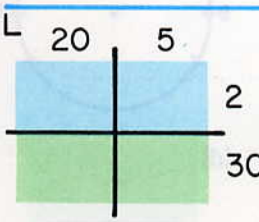
23
x 23

K



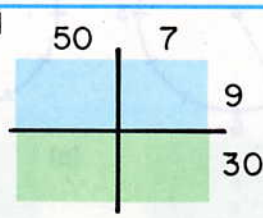
32
x 17

L



25
x 32

M



57
x 39

Indicate the largest amount by writing an A in the blue block, the next largest by a B, the next largest by a C, etc. Compute the differences asked for in each exercise.

I

seven thousand eighty

seventy-eight hundred

seven thousand eight

difference between

A and B: _____

B and C: _____

A and C: _____

II

four thousand two hundred

four thousand two

four thousand one hundred two

difference between

A and B: _____

B and C: _____

A and C: _____

III

7 6 5 4

4 7 6 5

5 4 7 6

6 5 4 7

difference between

A and B: _____ B and D: _____

B and C: _____ C and D: _____

A and C: _____ A and D: _____

IV

3 2 1 0

3 2 1

1 0 3 2

2 1 0 3

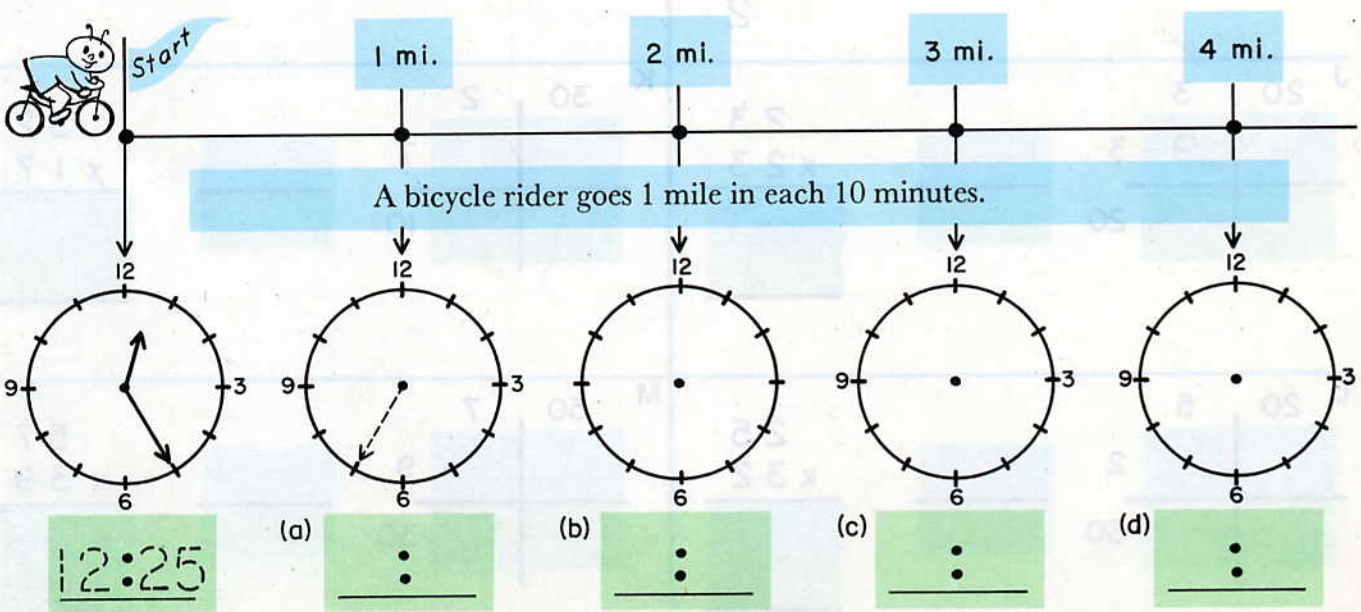
difference between

A and B: _____ B and D: _____

B and C: _____ C and D: _____

A and C: _____ A and D: _____

V



(e) He goes _____ miles in 1 hour.

(f) He goes _____ miles in 2½ hours.

Draw a loop around the pair that would make the sentence true.

□ x 3 = 2 x ○

3, 3 | 7, 9 | 4, 6 | 1, 2

A 4 x 5 = △ + □ − 7

20, 3 | 19, 8 | 9, 9 | 28, 35

B (3 x □) + 2 = (5 x ○) + 3

8, 5 | 9, 5 | 10, 6 | 7, 4

C 4 x △ = (□ x 7) + 3

6, 3 | 6, 4 | 5, 2 | 10, 6

D ○ x △ = 4 x 8

12, 12 | 16, 2 | 4, 12 | 9, 3

E △ + △ = □ x □

5, 4 | 2, 2 | 3, 2 | 1, 1

F ○ x 8 = (□ x 10) − 10

7, 7 | 4, 12 | 5, 5 | 8, 54

G (△ x 10) − 1 = 7 x ○

6, 8 | 6, 9 | 3, 4 | 5, 7

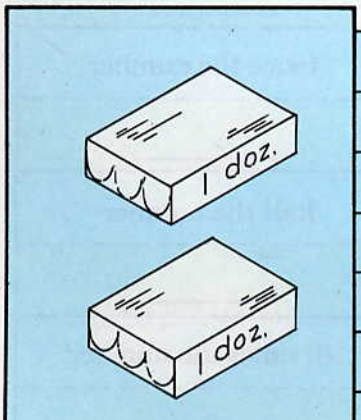
H (○ x 6) − 7 = (□ x 7) − 13

6, 6 | 3, 4 | 10, 9 | 5, 5

I

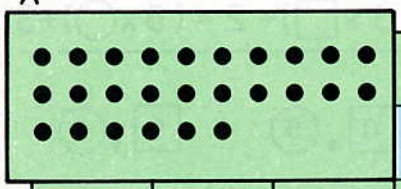
twice as much	28 ¢	4 times as much	$.
3 times as much	¢	6 times as much	$.
5 times as much	¢	10 times as much	$.
8 times as much	¢	16 times as much	$.
13 times as much	¢	26 times as much	$.
21 times as much	¢	42 times as much	$.
half as much	¢	68 times as much	$.

J



number of eggs	24	3 times as many	
half as many		twice as many	
one-fourth as many		5 times as many	
one-third as many		10 times as many	
a half-dozen more		15 times as many	
a half-dozen less		25 times as many	
a doz. and a half less		40 times as many	

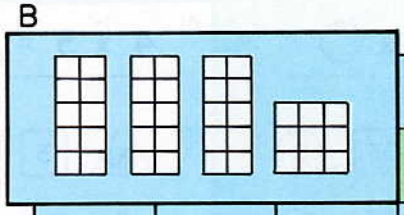
A



How many?	+ 10
26	

+ 30	− 20	x 2	x 1	x 3
56				

B



How many?	− 9

− 20	− 30	− 29	− 39	+ 40
	9			

C

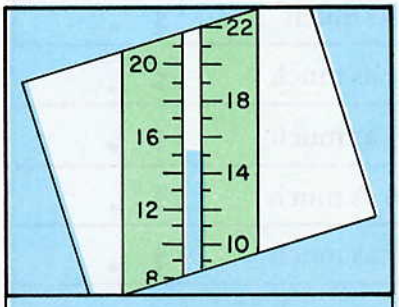
A	B	C	D	E
F	G	H	I	J
K	L	M	N	O
P	Q	R	S	T
U	V	W	X	Y

twice as many		4 times as many	
3 times as many		5 times as many	

D

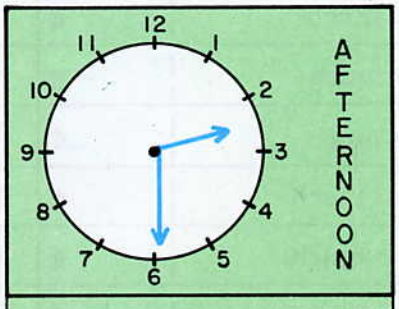
2 times as much		4 times as much	
3 times as much		6 times as much	
5 times as much		10 times as much	

E



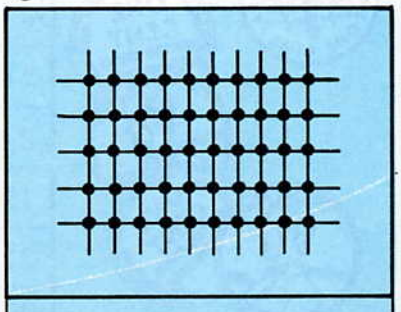
temperature shown
____
7° colder
____
7° warmer
____
15° colder
____

F



time shown
:
20 minutes later
:
20 minutes earlier
:
2½ hours later
:

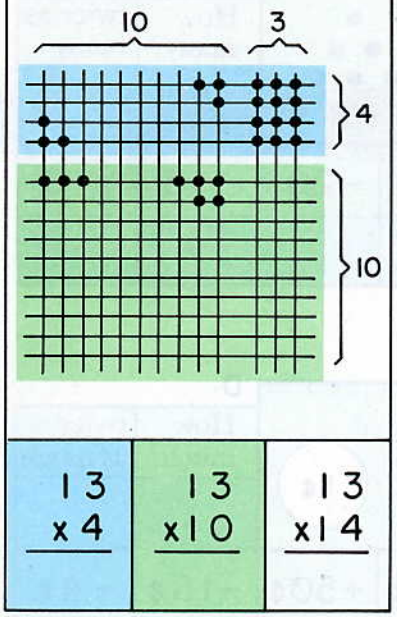
G



number of crossing points
____
twice the number
____
half the number
____
10 times the number
____

A

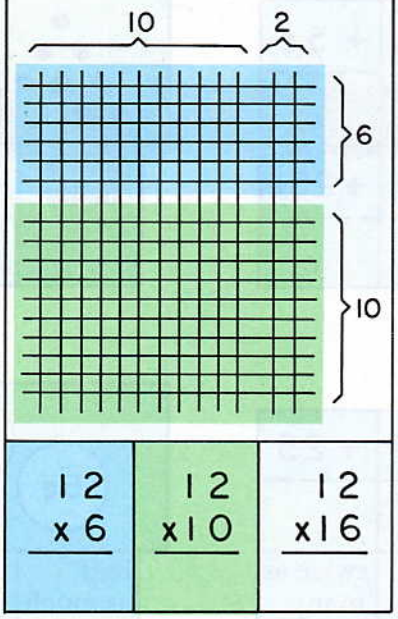
13 x 14 =



13 x 4	13 x 10	13 x 14

B

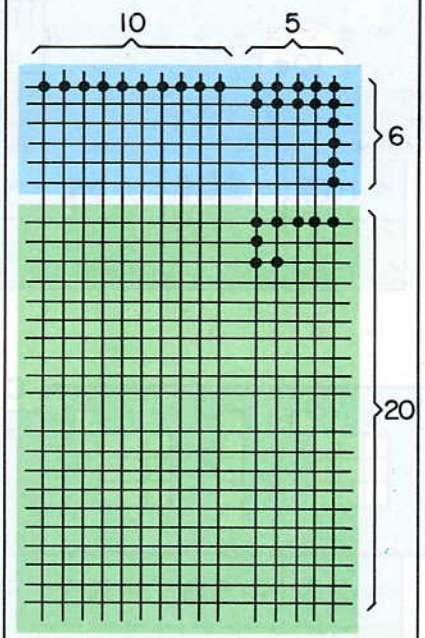
12 x 16 =



12 x 6	12 x 10	12 x 16

C

15 x 26 =

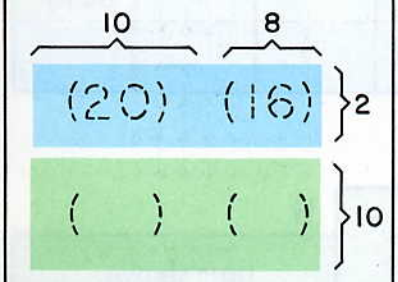


15 x 6	15 x 20	15 x 26

Sketches like these can become very large and hard to draw. Let's use diagrams that suggest large sketches.

D

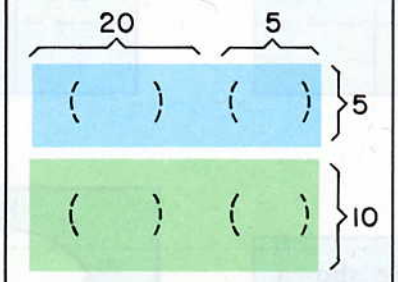
18 x 12 =



x 2	x 10	18 x 12

E

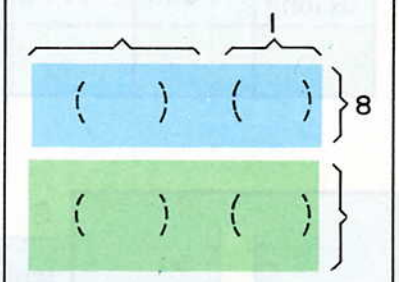
25 x 15 =



x 5	x	x 15

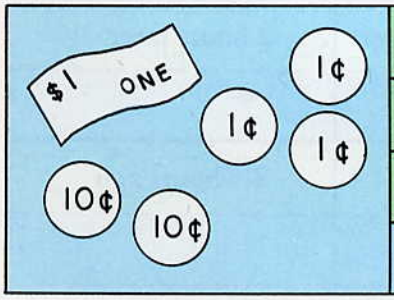
F

21 x 28 =



x 8	x	x

G



6 times as many dollar bills	$.	12 times as many dollar bills	$.
6 times as many dimes	$.	12 times as many dimes	$.
6 times as many pennies	$.	12 times as many pennies	$.
6 times as much as $1.23	$.	12 times as much as $1.23	$.

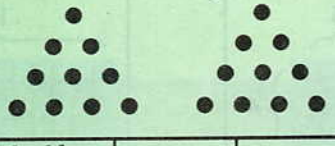
What Are My Rules?

A

How much?	+ 5¢
10¢	

+ 10¢	+ 20¢	− 5¢	− 10¢	+ 25¢

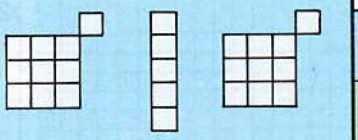
B



How many?	twice as many

half as many	+ 20	− 20	− 15	+ 18

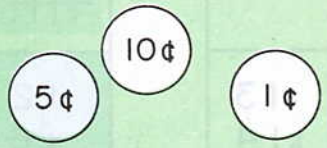
C



double	+ 25

− 23	+ 50	+ 65	− 8	twice as many

D



How much?	twice as much

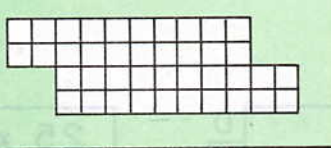
half as much	+ 15¢	+ 50¢	− 16¢	− 4¢

E

total length	half as long
in.	

twice as long	+ 6 in.	− 11 in.	+ 12 in.	+ 1 ft.

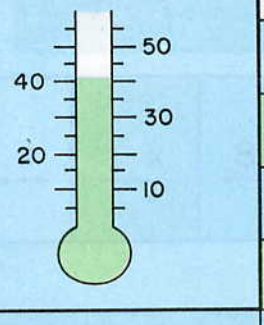
F



double	− 20

+ 26	− 15	− 40	+ 60	half as many

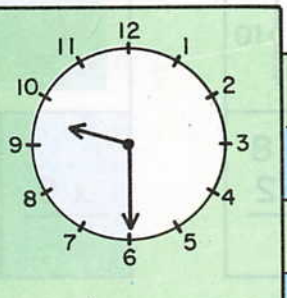
G



temperature shown	
up 32°	

down 32°	45° colder
45° warmer	60° warmer

H



time shown	
10 minutes later	

10 minutes earlier	2 hours later
2 hours ago	2½ hours ago

Sometimes we need ways to suggest very large sketches.
These sketches would include hundreds of crossing points.

A 132 x 3 =

100 30 2

(300) (90) (6) } 3

100 x 3	30 x 3	2 x 3	132 x 3

B 256 x 4 =

200 50 6

( ) ( ) ( ) } 4

x 4	50 x 4	6 x 4	256 x 4

C 317 x 5 =

( ) ( ) ( )

x 5	10 x 5	7 x 5	317 x 5

D 196 x 7 =

( ) ( ) ( )

100 x 7	x 7	x 7	196 x 7

If you need sketches for the following examples, use a piece of scratch paper.

E 214 x 9 =

x	x	x	x

F 305 x 8 =

x 8	0 x 8	x 8	x

G x =

x	x	x	x 6 = 1416

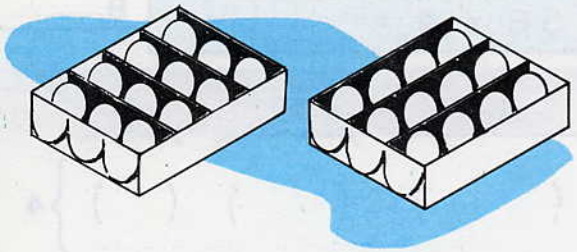
H x 9 = 1836

x	x	x	x

I

5 x	8	7	5	20	8	10	300	318				
	40								15	350	500	865

Here are two ways we can think about a dozen eggs:



On the left we see 4 groups of ____ eggs. On the right, we see 3 groups of ____ eggs.

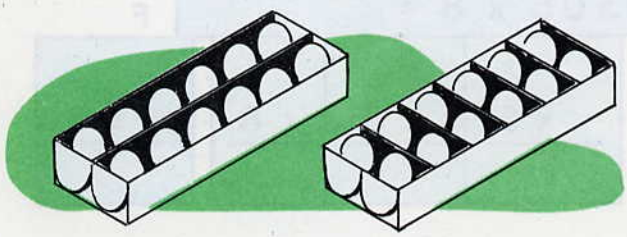
Or, we might say that 12 eggs can be divided into ____ groups of 3 eggs, or into ____ groups of 4 eggs.

This suggests the following mathematical sentences:

$3 \times 4 =$ ____ $\quad 4 \times 3 =$ ____

$12 \div 3 =$ ____ $\quad 12 \div 4 =$ ____

Here are two other ways of thinking about a dozen eggs:



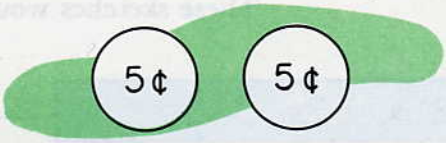
These ways of thinking about a dozen eggs suggest these mathematical sentences:

$2 \times 6 =$ ____ $\quad 6 \times 2 =$ ____

$12 \div 6 =$ ____ $\quad 12 \div 2 =$ ____

We might also notice that there are ____ eggs in two dozen eggs.

If we think about 10¢ as two nickels:

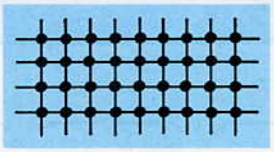


this might suggest the following mathematical sentences:

$2 \times$ ____ $= 10$ $\quad$ ____ $\times 2 =$ ____

____ $\div 2 =$ ____ $\quad$ ____ $\div$ ____ $= 2$

Thinking about lines and crossing points, this sketch:



suggests the following:

____ $\times 9 =$ ____ $\quad 9 \times$ ____ $=$ ____

____ $\div 9 =$ ____ $\quad$ ____ $\div$ ____ $= 9$

Another way of writing down this idea is:

$$4\overline{)36} \text{ or: } 9\overline{)36}$$

These are usually read: "36 divided by 4 equals ____" and "36 divided by ____ equals ____." But you could also think of them as saying:

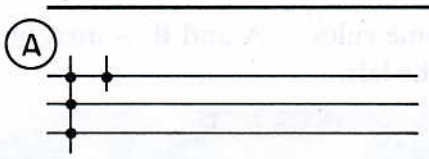
$4 \times 9 = 36$ and: $9 \times 4 = 36$

Thinking of lines and crossing points, the problem:

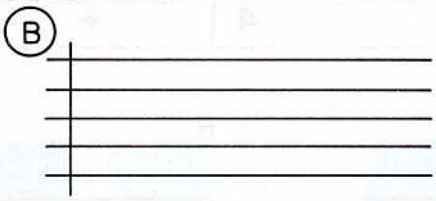
$$4\overline{)20}$$

asks the question: "If there are 20 crossing points on 4 horizontal lines, how many vertical lines must there be?" ____

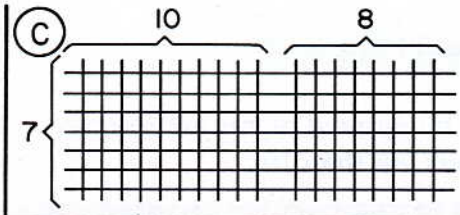
Please finish the following mathematical statements and the sketches they might suggest.



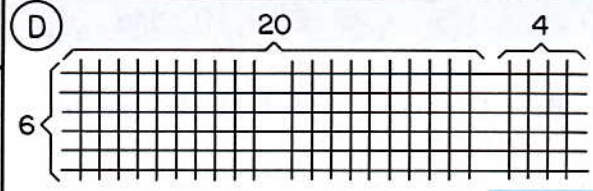
$3\overline{)27}$



$5\overline{)11}$



$7\overline{)}$

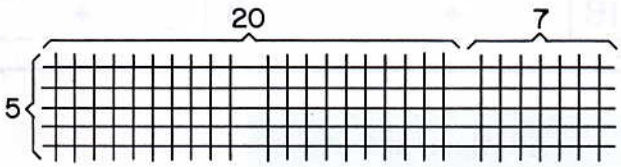


$6\overline{)}$

We might describe sketches C and D more fully in this way:

C $7\overline{)70 + 56}$ and D $6\overline{)120 + 24}$

Please describe the following sketch in a similar way:



E $5\overline{) + 7 \\ + }$

Since the sketches take up much space and are hard to draw, let's imagine them. When in doubt, draw the sketch on a piece of scratch paper.

F $3\overline{) + \\ 30 + 6}$

G $5\overline{) + 5 \\ 100 + }$

H $4\overline{)20 + 3 \\ + }$

I $\overline{)30 + 6 \\ + 12}$

J $8\overline{) + 7 \\ 160 + }$

K $7\overline{)40 + 6 \\ + }$

L $3\overline{)10 + 5 \\ + }$

M $9\overline{)10 + \\ + 45}$

N $5\overline{)20 + 6 \\ + }$

O $7\overline{)20 + \\ + 63}$

P $8\overline{)10 + 8 \\ + }$

Q $9\overline{)30 + 7 \\ + }$

R $4\overline{)40 + \\ + 32}$

S $6\overline{)20 + \\ + 54}$

T $12\overline{)10 + 3 \\ + }$

U $25\overline{) + 4 \\ 250 + }$

V $15\overline{) + \\ 300 + 60}$

W $11\overline{) + 9 \\ 330 + }$

X $20\overline{)30 + 7 \\ + }$

Y $13\overline{)10 + 0 \\ + }$

Z $\overline{) + 3 \\ 240 + 36}$

a $\overline{)30 + 8 \\ + 72}$

All About 144

Rule A: The blue-tinted blocks are reserved for whole numbers less than 10.

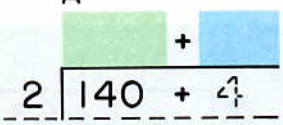
0, 1, 2, 3, 4, 5, 6, 7, 8 and 9

Rule B: The green-tinted blocks are for multiples of 10.

0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120 .... 190, 200, 210 ..... etc.

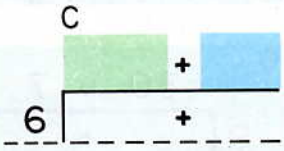
(You may wish to think of these examples as referring to sketches with 144 crossing points.)

A

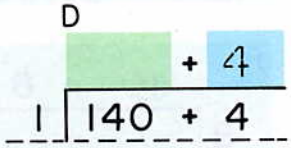


B

C

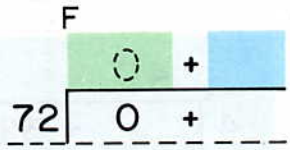


D

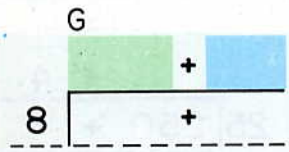


E

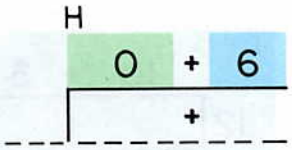
F



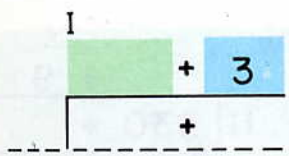
G



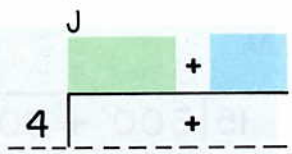
H



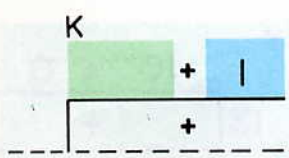
I



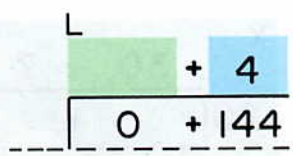
J



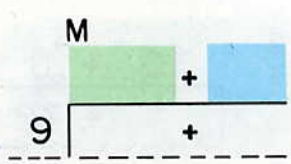
K



L



M



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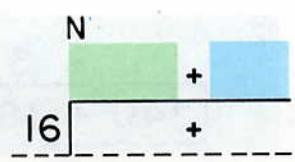
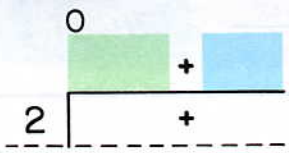


All About 216

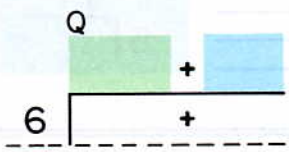
Follow the same rules — A and B — used in the column on the left.

O



P

Q



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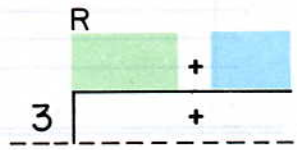
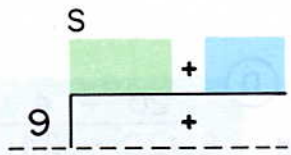
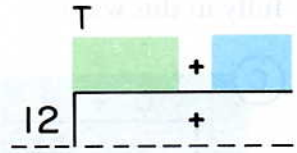


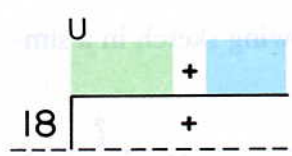
S



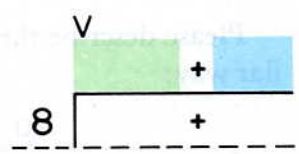
T



U



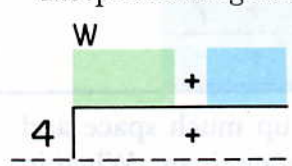
V



All About 324

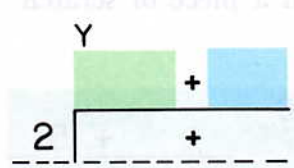
Keep following rules A and B.

W

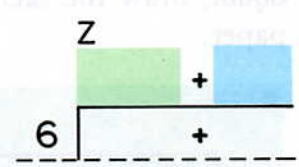


X

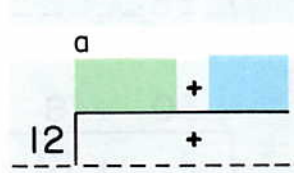
Y



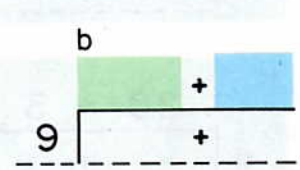
Z



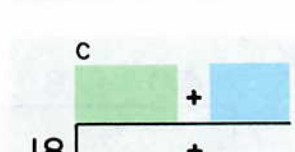
a



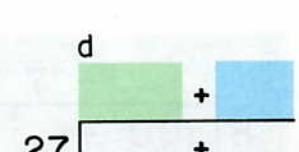
b



c



d



Work rapidly. KEEP LOOKING FOR TIME-SAVERS.

a.

$3\overline{)30}$ $3\overline{)15}$ $3\overline{)45}$

b.

$4\overline{)80}$ $4\overline{)16}$ $4\overline{)96}$

c.

$5\overline{)100}$ $5\overline{)75}$ $5\overline{)\ \ 35}$

d.

$8\overline{)\ \ 20}$ $8\overline{)32}$ $8\overline{)192}$

e.

$12\overline{)120}$ $12\overline{)60}$ $12\overline{)\ \ 15}$

f.

$6\overline{)300}$

$6\overline{)54}$

$6\overline{)354}$

g.

$9\overline{)180}$

$9\overline{)\ \ 7}$

$9\overline{)\ \ 27}$

h.

$7\overline{)\ \ 30}$

$7\overline{)42}$

$7\overline{)252}$

i.

$9\overline{)\ \ 30}$

$9\overline{)72}$

$9\overline{)342}$

j.

$15\overline{)300}$

$15\overline{)\ \ 7}$

$15\overline{)\ \ 27}$

k.

$8\overline{)480}$

$8\overline{)56}$

$8\overline{)536}$

l.

$7\overline{)700}$

$7\overline{)70}$

$7\overline{)21}$

$7\overline{)791}$

m.

$5\overline{)1000}$

$5\overline{)150}$

$5\overline{)\ \ 9}$

$5\overline{)\ \ 239}$

n.

$8\overline{)800}$

$8\overline{)240}$

$8\overline{)40}$

$8\overline{)1080}$

o.

$4\overline{)1200}$

$4\overline{)200}$

$4\overline{)36}$

$4\overline{)1436}$

p.

$9\overline{)\ \ 200}$

$9\overline{)\ \ 70}$

$9\overline{)\ \ 6}$

$9\overline{)\ \ 276}$

q.

$7\overline{)\ \ 1000}$

$7\overline{)\ \ 50}$

$7\overline{)\ \ 7}$

$7\overline{)\ \ 1057}$

Rules of the MONEY GAME:

A. First digit to the left of the period indicates dollars.

B. First digit to the right of the period indicates dimes.

C. Second digit to the right of the period indicates pennies.

D. Digits allowed are: 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9.

Sign of the game: $

a. $ 1.00 + $ 2.00 = $ 3.00

b. $ 1.10 + $ 1.20 = $ ____

c. $ 0.80 + $ 0.20 = $ ____

d. $ 0.50 + $ 0.75 = $ ____

e. $ 1.47 + $ 4.37 = $ ____

f. $ 4.00 − $ 1.00 = $ ____

g. $ 2.00 − $ 0.70 = $ ____

h. $ 2.50 − $ 0.75 = $ ____

i. $ 3.20 − $ 1.25 = $ ____

j. $ 7.36 − $ 3.59 = $ ____

We can use the same rules when we multiply and divide in the Money Game.

k. 2 x $ 2.15 = $ 4.30

l. $ 1.50 x 3 = $ ____

m. 5 x $ 0.20 = $ ____

n. $ 1.25 x 4 = $ ____

o. 3 x $ 2.41 = $ ____

p. $ 4.30 ÷ 2 = $ ____

q. $ 3.00 ÷ 2 = $ ____

r. $ 3.39 ÷ 3 = $ ____

s. $ 1.20 ÷ 3 = $ ____

t. $ 2.19 ÷ 3 = $ ____

u. $ 1.05 x 3 = $ ____

v. $ 2.25 x 4 = $ ____

w. $ 0.55 x 2 = $ ____

x. $ 1.38 x 3 = $ ____

y. 6 x $ 1.29 = $ ____

z. $ 1.83 x 5 = $ ____

A. $3\overline{)\$\ 3.24}$

B. $2\overline{)\$\ 5.00}$

C. $2\overline{)\$\ 0.18}$

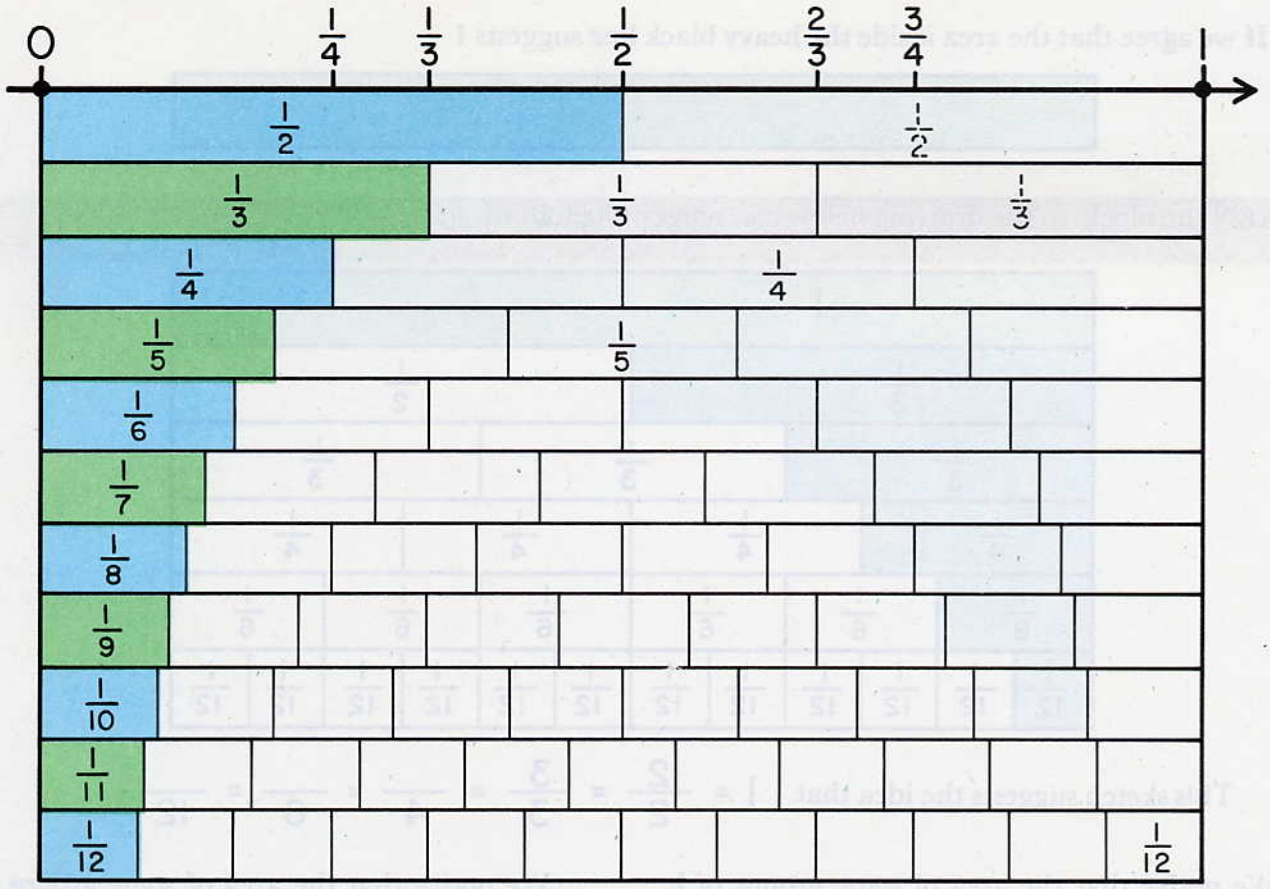
D. $5\overline{)\$\ 2.50}$

E. $3\overline{)\$\ 1.17}$

F. $5\overline{)\$\ 8.35}$

G. $4\overline{)\$\ 9.72}$

H. $6\overline{)\$\ 7.26}$



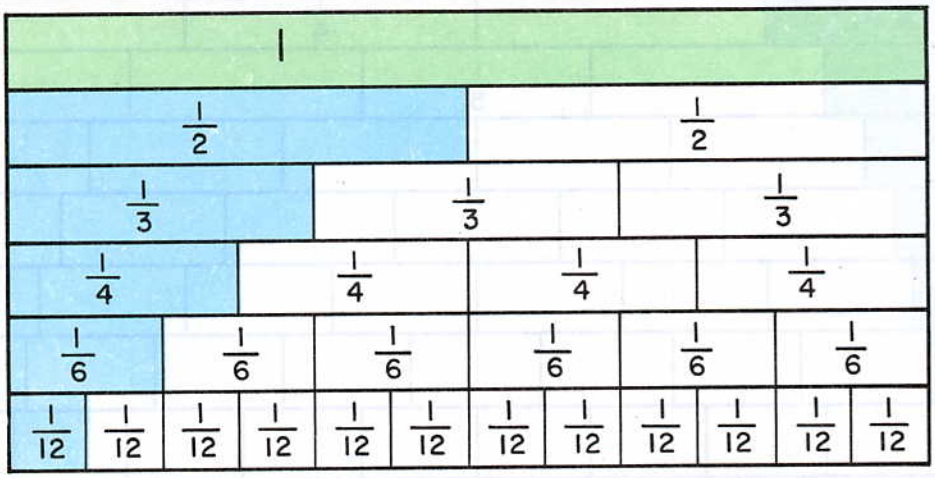
Make TRUE sentences.

= is equal to < is less than > is greater than

	A	B	C	D
I	$\frac{1}{3} < \frac{1}{2}$	$\frac{1}{2} \square \frac{2}{3}$	$\frac{3}{8} \square \frac{3}{10}$	$\frac{1}{2} = \frac{2}{4} = \frac{3}{6} \square \frac{5}{10}$
II	$\frac{1}{8} \square \frac{1}{10}$	$\frac{2}{5} \square \frac{1}{4}$	$\frac{6}{12} \square \frac{6}{11}$	$\frac{3}{7} \square \frac{3}{8} \square \frac{3}{9} \square \frac{3}{10}$
III	$\frac{1}{4} \square \frac{1}{6}$	$\frac{2}{4} \square \frac{1}{2}$	$\frac{3}{4} \square \frac{4}{5}$	$\frac{2}{3} \square \frac{3}{4} \square \frac{4}{5} \square \frac{5}{6}$
IV	$\frac{1}{11} \square \frac{1}{10}$	$\frac{2}{12} \square \frac{1}{3}$	$\frac{5}{6} \square \frac{4}{7}$	$\frac{2}{6} \square \frac{1}{3} \square \frac{3}{9} \square \frac{5}{12}$
V	$\frac{1}{6} \square \frac{1}{7}$	$\frac{3}{9} \square \frac{2}{3}$	$\frac{9}{11} \square \frac{2}{3}$	$\frac{2}{7} \square \frac{1}{4} \square \frac{3}{12} \square \frac{2}{8}$
VI	$\frac{1}{2} \square \frac{1}{4}$	$\frac{3}{5} \square \frac{1}{2}$	$\frac{6}{12} \square \frac{1}{2}$	$\frac{5}{12} \square \frac{4}{10} \square \frac{2}{5} \square \frac{4}{9}$

If we agree that the area inside the heavy black line suggests 1

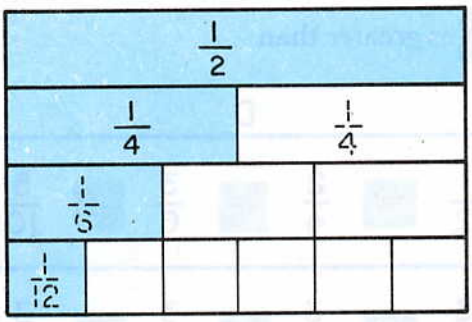
THEN the blocks in the drawing below can suggest the following:



This sketch suggests the idea that $1 = \frac{2}{2} = \frac{3}{3} = \frac{\quad}{4} = \frac{\quad}{6} = \frac{\quad}{12}$.

We notice that the area of some groups of blocks is the same as that of some single blocks.

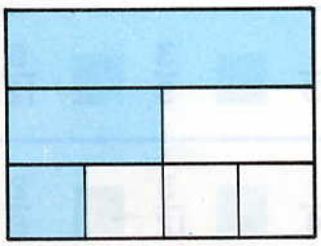
A



This sketch suggests that

$\frac{1}{2} = \frac{2}{4} = \frac{\quad}{\quad} = \frac{\quad}{\quad}$.

B

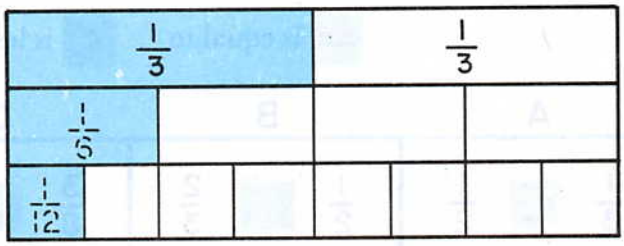


This sketch suggests that

$\frac{\quad}{\quad} = \frac{\quad}{\quad} = \frac{\quad}{\quad}$.

We notice that the area of some groups of blocks is the same as that of other groups.

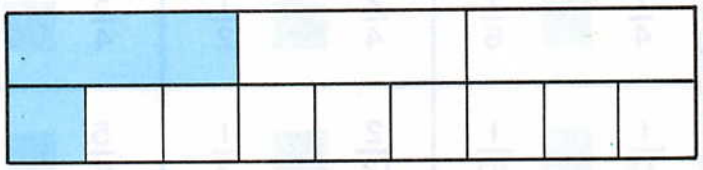
C



This suggests that

$\frac{2}{3} = \frac{\quad}{\quad} = \frac{\quad}{\quad}$.

D



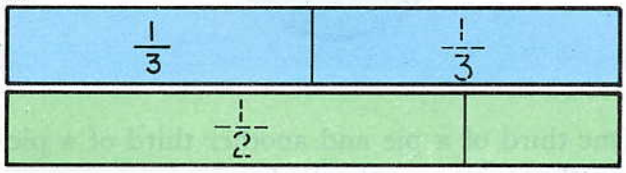
This suggests that

$\frac{\quad}{\quad} = \frac{\quad}{\quad}$.

We also notice that the large sketch at the top of the page suggests that $\frac{5}{6} = \frac{\quad}{\quad}$.

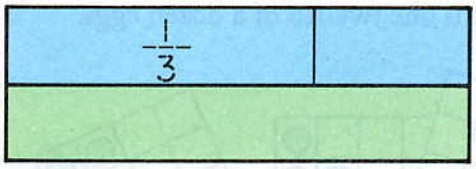
Some combinations of blocks have the same area as that of other combinations or as that of single blocks. Please note the mathematical facts suggested by the sketches.

A



$\frac{2}{3} = \frac{1}{2} + \frac{1}{\quad}$ $\qquad \frac{2}{3} - \frac{1}{6} = \frac{\quad}{\quad}$

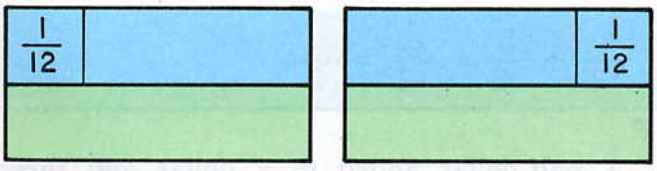
B



$\frac{1}{3} + \frac{\quad}{\quad} = \frac{\quad}{\quad}$ $\qquad \frac{\quad}{\quad} - \frac{1}{3} = \frac{\quad}{\quad}$

$\frac{\quad}{\quad} + \frac{1}{3} = \frac{\quad}{\quad}$ $\qquad \frac{\quad}{\quad} - \frac{\quad}{\quad} = \frac{1}{3}$

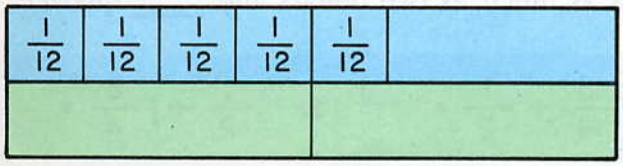
C



$\frac{1}{12} + \frac{\quad}{\quad} = \frac{\quad}{\quad}$ $\qquad \frac{\quad}{\quad} + \frac{1}{12} = \frac{\quad}{\quad}$

$\frac{\quad}{\quad} - \frac{1}{12} = \frac{\quad}{\quad}$ $\qquad \frac{\quad}{\quad} - \frac{\quad}{\quad} = \frac{1}{12}$

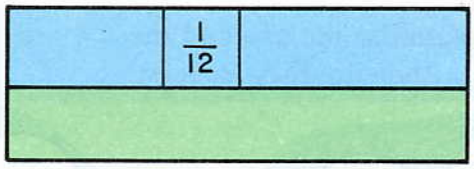
D



$\frac{5}{12} + \frac{\quad}{\quad} = \frac{\quad}{\quad}$ $\qquad \frac{\quad}{\quad} + \frac{5}{12} = \frac{\quad}{\quad}$

$\frac{\quad}{\quad} - \frac{5}{12} = \frac{\quad}{\quad}$ $\qquad \frac{\quad}{\quad} - \frac{\quad}{\quad} = \frac{5}{12}$

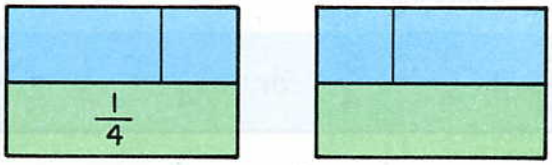
E



$\frac{\quad}{\quad} + \frac{1}{12} + \frac{\quad}{\quad} = \frac{\quad}{\quad}$

$\frac{\quad}{\quad} - \frac{1}{12} = \frac{\quad}{\quad} + \frac{\quad}{\quad}$

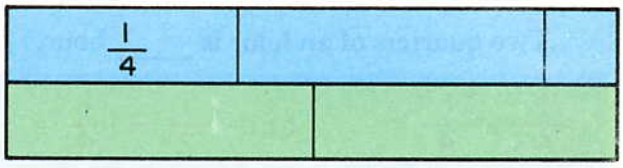
F



$\frac{\quad}{\quad} + \frac{\quad}{\quad} = \frac{1}{4}$ $\qquad \frac{1}{4} - \frac{\quad}{\quad} = \frac{\quad}{\quad}$

$\frac{\quad}{\quad} + \frac{\quad}{\quad} = \frac{1}{4}$ $\qquad \frac{1}{4} - \frac{\quad}{\quad} = \frac{\quad}{\quad}$

G



$\frac{1}{4} + \frac{\quad}{\quad} + \frac{\quad}{\quad} = \frac{\quad}{\quad}$

$\frac{\quad}{\quad} - \frac{1}{4} = \frac{\quad}{\quad} + \frac{\quad}{\quad}$

Please complete the following as similar sketches would suggest:

H $\frac{1}{2} - \frac{1}{12} = \frac{\quad}{\quad}$ $\qquad$ I $\frac{7}{12} + \frac{1}{12} = \frac{\quad}{\quad}$

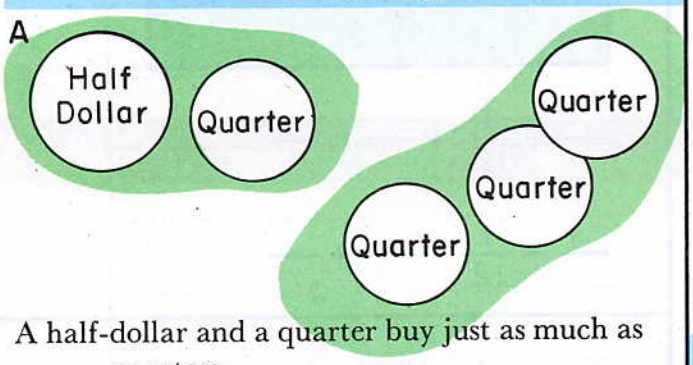
J $\frac{1}{3} + \frac{1}{2} = \frac{\quad}{\quad}$ $\qquad$ K $\frac{1}{4} + \frac{1}{3} = \frac{\quad}{\quad}$

L $\frac{2}{3} + \frac{1}{12} = \frac{\quad}{\quad}$ $\qquad$ M $\frac{3}{4} - \frac{2}{3} = \frac{\quad}{\quad}$

N $\frac{1}{4} + \frac{5}{12} = \frac{\quad}{\quad}$ $\qquad$ O $\frac{2}{3} - \frac{1}{2} = \frac{\quad}{\quad}$

Familiar ideas — and the arithmetic they suggest.

A

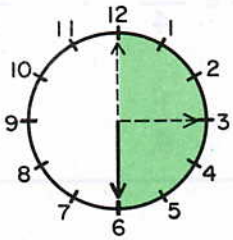


A half-dollar and a quarter buy just as much as ____ quarters.

$\frac{1}{2} + \frac{1}{4} = \frac{3}{4}$ or $\frac{1}{4} + \frac{1}{2} =$ ___

B

Two quarters of an hour:



Two quarters of an hour is ____ hour.

$\frac{1}{4} + \frac{1}{4} =$ and $\frac{1}{2} - \frac{1}{4} =$

C

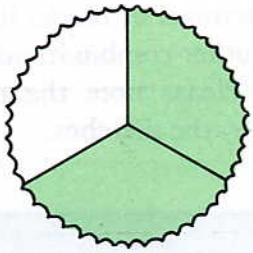
A day is one seventh of a week.

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11

Two sevenths of a week and three sevenths of a week are the same as ____ sevenths of a week.

$\frac{2}{7} + \frac{3}{7} =$ or $\frac{3}{7} + \frac{2}{7} =$

D

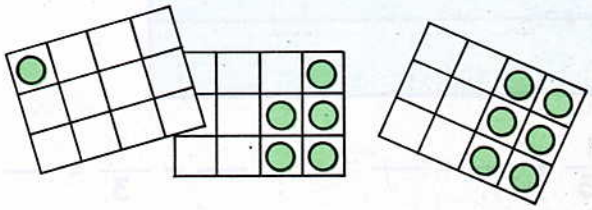


One third of a pie and another third of a pie together are ____ thirds of a pie.

$\frac{1}{3} + \frac{1}{3} =$ and $\frac{2}{3} - \frac{1}{3} =$

E

One egg is one twelfth of a dozen eggs.

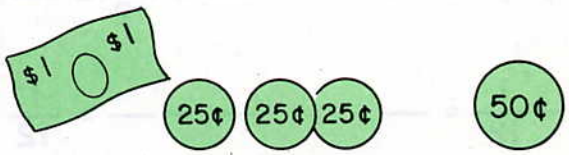


One twelfth of a dozen and five twelfths of a dozen is the same as ____ twelfths of a dozen or ____ half-dozen.

$\frac{1}{12} + \frac{5}{12} = \frac{6}{12} = \frac{}{2}$

F

A half-dollar added to a dollar and three quarters . . .



is as much as two dollars and ____ quarter.

$1\frac{3}{4} + \frac{1}{2} =$ or $\frac{1}{2} + 1\frac{3}{4} =$

G $\frac{3}{4} - \frac{1}{2} =$

H $\frac{3}{4} - \quad = \frac{1}{2}$

I $\frac{1}{2} + \frac{1}{12} =$

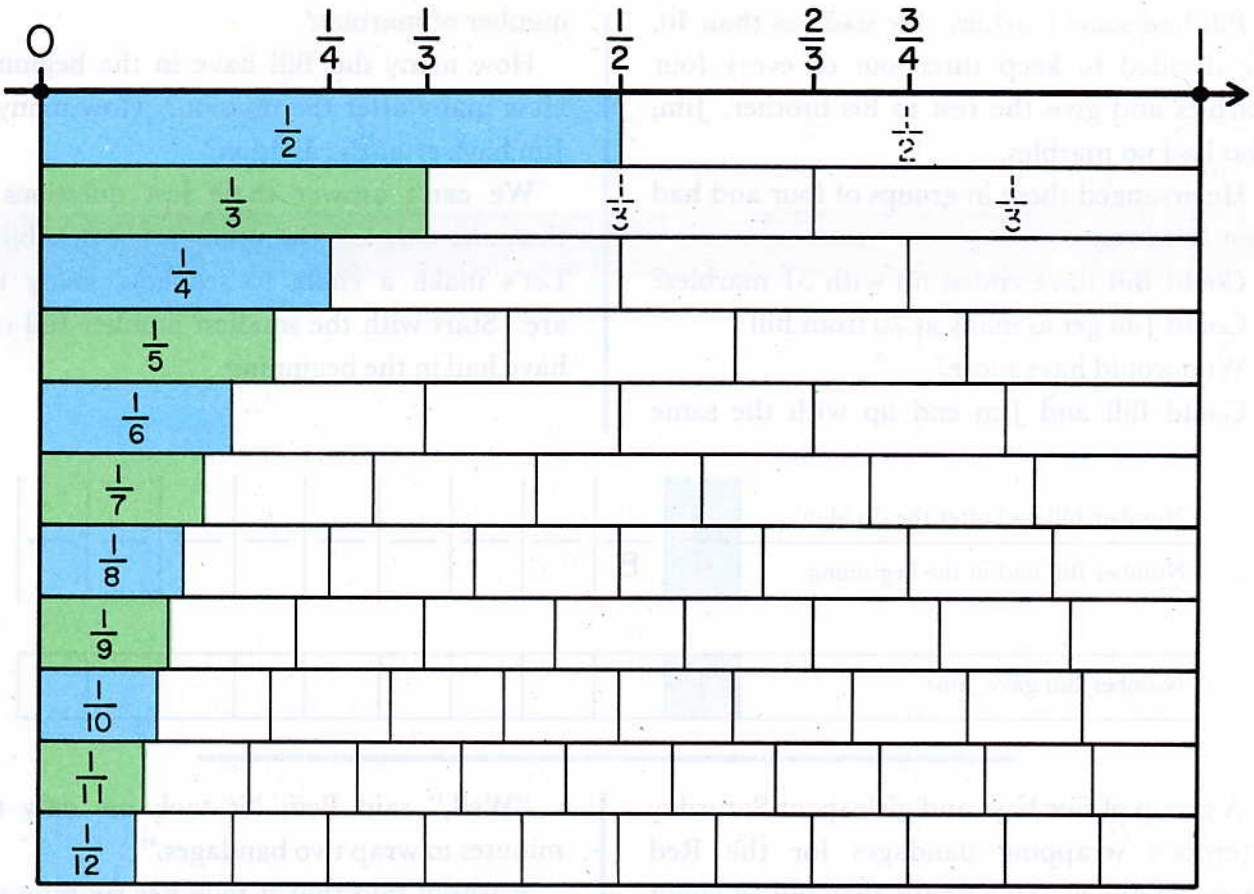
J $\frac{1}{2} - \frac{1}{12} =$

K $1 - \frac{1}{2} =$

L $2 - \frac{1}{2} =$

M $1 - \frac{1}{4} =$

N $97 - \frac{1}{4} =$



Make TRUE sentences.

= is equal to < is less than > is greater than

	A	B	C	D
I	$\frac{5}{6} \square \frac{6}{7}$	$\frac{2}{5} \square \frac{3}{7}$	$\frac{5}{11} \square \frac{1}{2}$	$\frac{2}{3} \square \frac{5}{7}$
II	$\frac{1}{2} + \frac{1}{2} \square \frac{1}{3} + \frac{1}{3}$	$\frac{1}{2} - \frac{1}{2} \square \frac{1}{3} - \frac{1}{3}$	$\frac{1}{3} + \frac{2}{3} \square \frac{1}{2} + \frac{3}{4}$	$\frac{2}{5} + \frac{3}{5} \square \frac{1}{2} + \frac{2}{3}$
III	$\frac{1}{3} + \frac{1}{2} \square \frac{1}{2} + \frac{1}{3}$	$\frac{1}{3} + \frac{1}{3} \square \frac{1}{2} - \frac{1}{3}$	$\frac{3}{4} - \frac{1}{2} \square \frac{1}{4} + \frac{1}{4}$	$\frac{3}{4} + \frac{3}{4} \square \frac{2}{5} + \frac{3}{5}$
IV	$\frac{5}{6} - \frac{1}{3} \square \frac{1}{8} + \frac{3}{8}$	$\frac{1}{9} + \frac{1}{9} \square \frac{2}{12} + \frac{1}{12}$	$\frac{7}{12} + \frac{5}{12} \square \frac{3}{8} + \frac{5}{8}$	$\frac{2}{7} + \frac{1}{6} \square \frac{1}{5} + \frac{2}{5}$
V	$2 + \frac{1}{3} \square 2 + \frac{1}{4}$	$2 + \frac{3}{4} \square 3 - \frac{1}{2}$	$3 + \frac{7}{12} \square \frac{7}{12} + 3$	$\frac{1}{2} + \frac{1}{2} \square 2 - \frac{1}{2}$
VI	$\frac{2}{3} + \frac{3}{4} \square \frac{2}{4} + \frac{3}{3}$	$\frac{1}{2} + \frac{1}{3} \square \frac{1}{5} + \frac{3}{5}$	$\frac{1}{2} + \frac{1}{2} \square \frac{1}{2} + \frac{1}{2}$	$\frac{2}{3} + \frac{1}{3} \square \frac{1}{3} + \frac{1}{3}$

Bill had some marbles. He had less than 40. He decided to keep three out of every four marbles and give the rest to his brother, Jim, who had no marbles.

He arranged them in groups of four and had none left over.

Could Bill have ended up with 51 marbles?

Could Jim get as many as 20 from Bill?

Who would have more?

Could Bill and Jim end up with the same number of marbles?

How many did Bill have in the beginning? How many after the division? How many did Jim have after the division?

We can't answer these last questions but there are only a certain number of possibilities. Let's make a chart to see how many these are. Start with the smallest number Bill could have had in the beginning.

Number Bill had after the division:	3									
Number Bill had in the beginning:	4	8								
Number Bill gave Jim:	1									

A group of five boys and girls spent Saturday afternoon wrapping bandages for the Red Cross. While walking home, they talked about how fast they worked.

Alice said that she wrapped three bandages every four minutes.

"Well," said Ben, "it took me only three minutes to wrap two bandages."

Kathryn said that it took her six minutes to wrap five bandages. Paul reported seven bandages in nine minutes.

"I wrapped nine in twelve minutes. Isn't that the best record?" said Jerry.

Who had the best record?

Number of bandages Alice wrapped	3	6								
Time in minutes	4									
Number of bandages Ben wrapped	2									
Time in minutes	3									
Number of bandages Kathryn wrapped	5									
Time in minutes	6									
Number of bandages Paul wrapped	7									
Time in minutes	9									
Number of bandages Jerry wrapped	9									
Time in minutes	12									

Frank is a clerk in a candy store. Different kinds of candy are sold at different prices. No pennies are allowed in this store.

Chocolates are five cents each or one for five cents. Licorice sells at three pieces for five cents. Peppermints are sold two for five cents; and gum drops are four for five cents. There are five pieces of butterscotch in each five-cent purchase. Pieces of butterscotch sold, therefore, at five pieces for five cents.

Frank decided to make a chart so he would not make mistakes.

Number of chocolates	1	—	—	—	—	—	—	—	—	—	—
Price in cents	5										
Number of peppermints	—	—	—	—	—	—	—	—	—	—	—
Price in cents											
Number of licorice sticks	—	—	—	—	—	—	—	—	—	—	—
Price in cents											
Number of gum drops	—	—	—	—	—	—	—	—	—	—	—
Price in cents											
Number of pieces of butterscotch	—	—	—	—	—	—	—	—	—	—	—
Price in cents											

a. Marcia bought eight pieces of candy and spent less than 15 cents. What did she buy?

b. Stewart bought four pieces of candy for 10 cents and his sister bought 12 pieces for 20 cents. Did they buy the same kind?

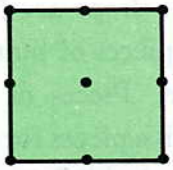
c. Jack spent a quarter and got 15 pieces of candy. Would he have had more pieces if he had bought peppermints?

d. Henrietta bought 27 pieces of one kind. What did she buy?

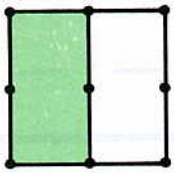
Mary had saved cola bottle caps. One day she stacked them in piles of six. She decided to give them all to her younger brothers — one out of every two to Phil, one out of every three to Bob, and the rest to Dick.

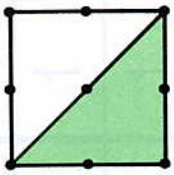
Make a chart showing how the division might go.

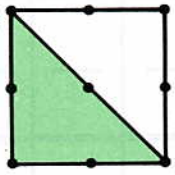
	Possible totals	Phil	Bob	Dick	B + D	P + D	P + B
e.	6						
f.	12						
g.							
h.							
i.							
j.							

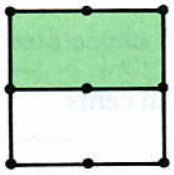
IF we agree that  suggests 1

THEN the shaded area in each picture below suggests →

a  → $\frac{1}{2}$

b  → —

c  → —

d  → —

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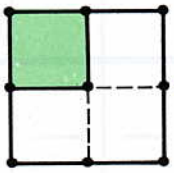
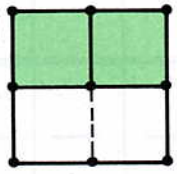
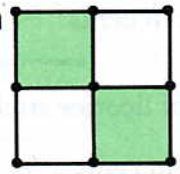
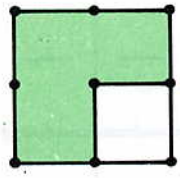
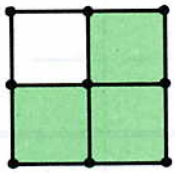
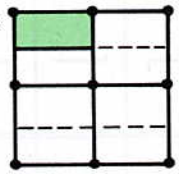
f  → —

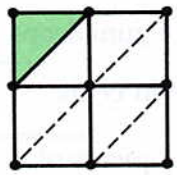
g  → —

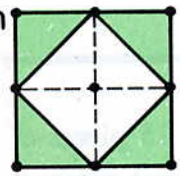
h  → —

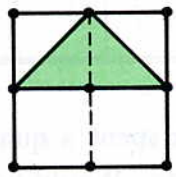
i  → —

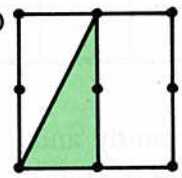
j  → —

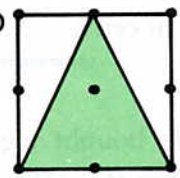
k  → —

l  → —

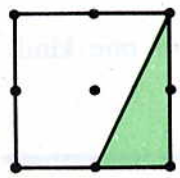
m  → —

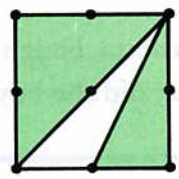
n  → —

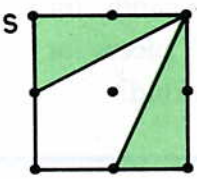
o  → —

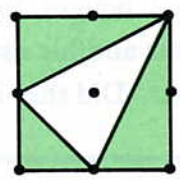
p  → —

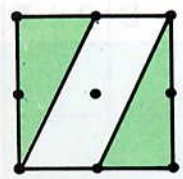
Hard work below!

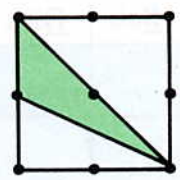
q  → —

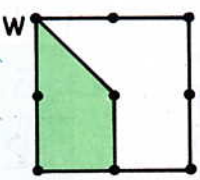
r  → —

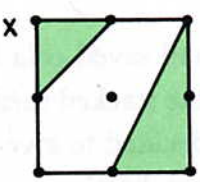
s  → —

t  → —

u  → —

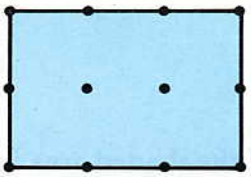
v  → —

w  → —

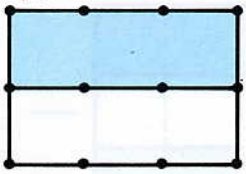
x  → —

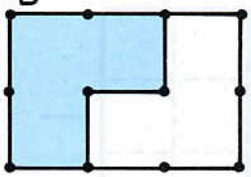
The unshaded areas suggest →

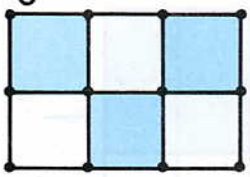
f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x
$\frac{3}{4}$	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

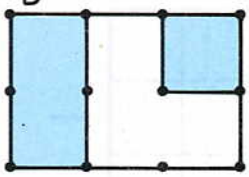
IF we agree that  suggests 1

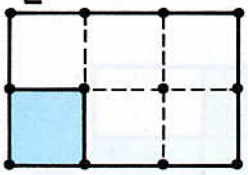
THEN the shaded area in each picture below suggests

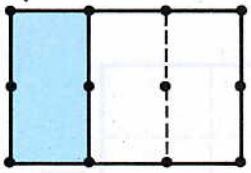
A  $\frac{1}{2}$

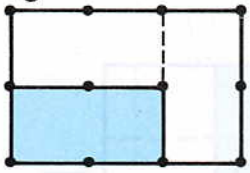
B  ___

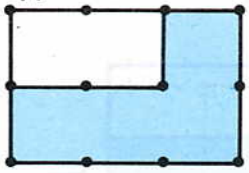
C  ___

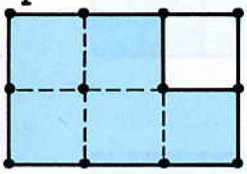
D  ___

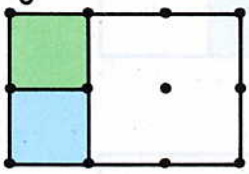
E  ___

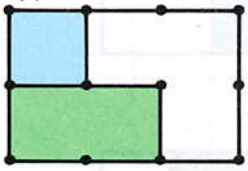
F  ___

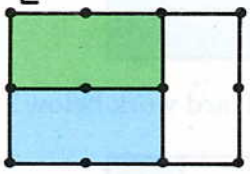
G  ___

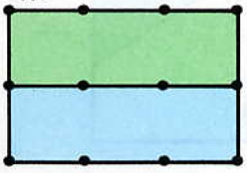
H  ___

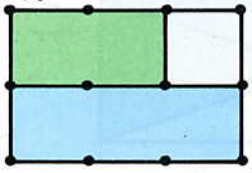
I  ___

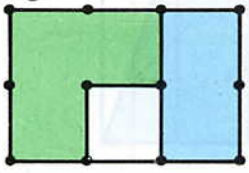
J  $\frac{1}{3}$

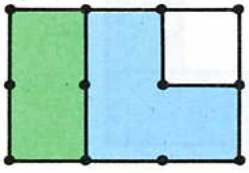
K  ___

L  ___

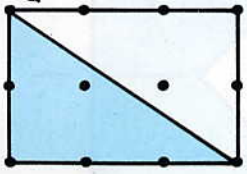
M  ___

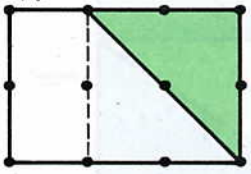
N  ___

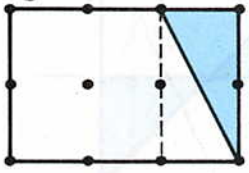
O  ___

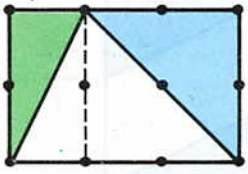
P  ___

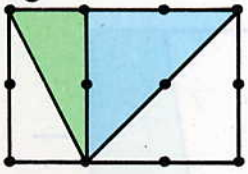
Hard work below!

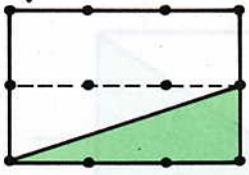
Q  ___

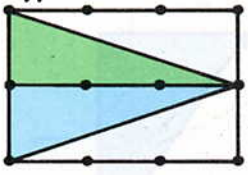
R  ___

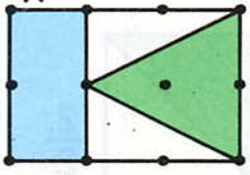
S  ___

T  ___

U  ___

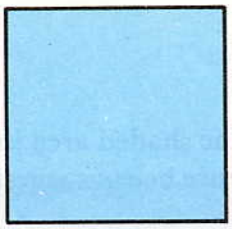
V  ___

W  ___

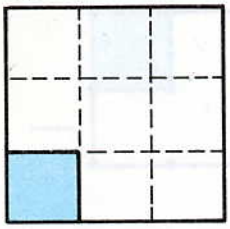
X  ___

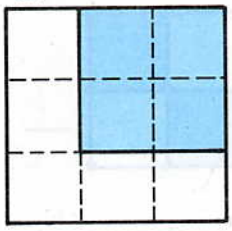
The unshaded areas suggest

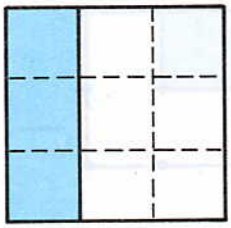
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	T	V	X
___	___	___	___	___	___	___	___	___	___	___	___	___	___	___	___	___	___	___

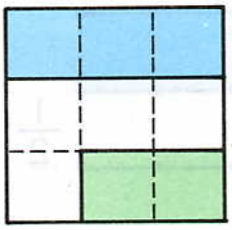
IF we agree that  suggests 1

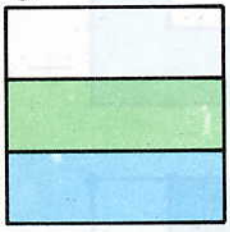
THEN the shaded area in each picture below suggests

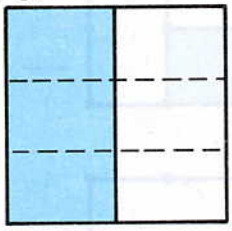
1.  —

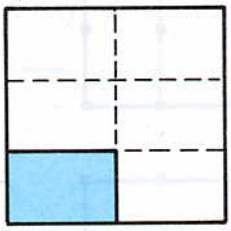
2.  —

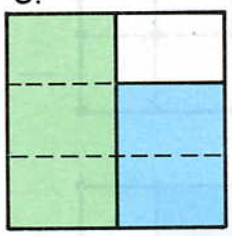
3.  —

4.  —

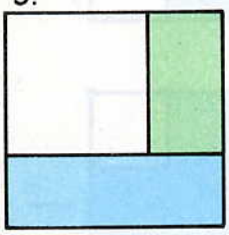
5.  —

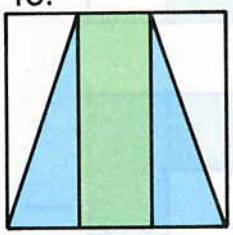
6.  —

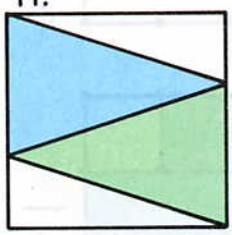
7.  —

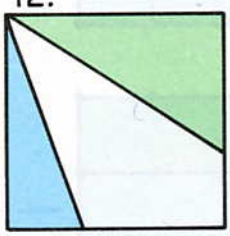
8.  —

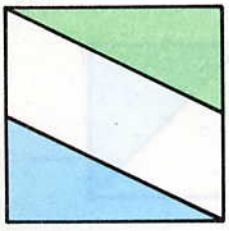
Hard work below!

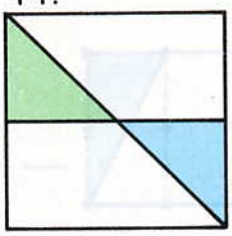
9.  —

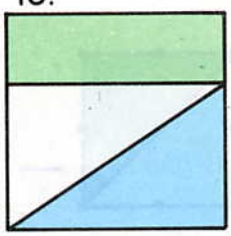
10.  —

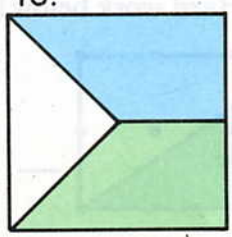
11.  —

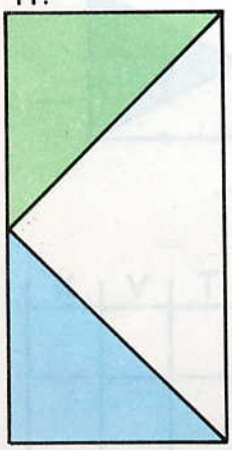
12.  —

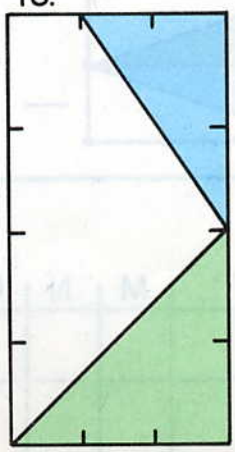
13.  —

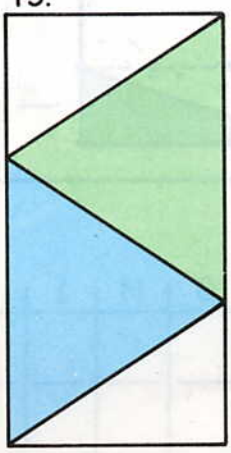
14.  —

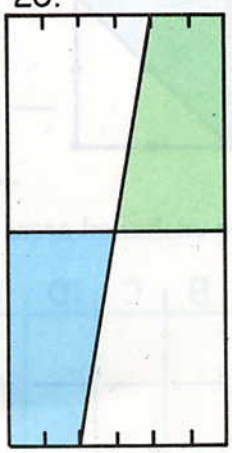
15.  —

16.  —

17.  $\frac{2}{2}$

18.  —

19.  —

20.  —